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Designed to provide students with an applied, portable, and transferable framework for integrating academic and career/occupational studies, this books uses a "whole learning" perspective to teach students to think, read, write, listen, speak, and problem-solve within the context of their academic and career subject matter. The book helps students make lasting connections among the worlds of knowledge, working, living, and achieving--providing students with learner-centered, lifelong intellectual and practical thinking and communication abilities. The book is divided into five parts: (1) How to Think Analytically; (2) How to Read Analytically; (3) How to Learn Analytically across the Curriculum (includes chapters on humanities, social studies, and sciences); (4) How to Write, Listen, and Speak Analytically; and (5) Managing Your College Career (developing good study habits). Over 125 analytical explorations in the book introduce, explain, and provide practice in whole learning. Appendix A contains templates for analytical displays and narratives; Appendix B discusses whole learning for speakers of English as a Second Language. (NKA)

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ED 374 395

ANALYTICAL STUDENT

A **Whole Learning** Study Guide for High School and College Students

Victor P. Maiorana

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The Analytical Student

A Whole Learning™ Study Guide for High School and College Students

by
Victor P. Maiorana

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ERIC Clearinghouse on Reading, English, and Communication

The Analytical Classroom™
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Whole Teaching-Whole Learning™

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Preface

Hello, Natural Analyst!

Let's say you are at a concert. The group decides to play their instruments in sequence. First you hear the entire drums part. Then you hear the entire guitar part. Then you hear the entire keyboard part, and so on. The group never plays the number all together as a whole piece of music. Always playing in sequence like this is awkward and unnatural. Sequential playing is sound without context, music without meaning. Everybody would boo. Nobody would clap. Bored to death, you would probably walk out.

Are you bored with your studies? Guess what! Much of school and college learning takes place in the same way as that sequential concert. Topics are presented one after another in sequence. That causes you to learn mostly by memorizing. In other words, you are learning subject matter by rote. That's boring! To learn by rote — over and over banging your head to make it memorize — is awkward and unnatural.

When you were a baby, before you started school, even before you started to crawl, what did you know at first? Almost nothing. Then how did you learn? In the beginning, you learned by placing things in your mouth. You tasted life directly, observing, relating, and making sense of the world around you. By sensing, you learned to think and analyze. You didn't learn by rote. It never even occurred to you to learn by rote. Life was not a test of memory. Life was an experience.

You did not memorize a nose, then eyes, then a mouth, in sequence. You took in a whole face. You did not crawl into a room and memorize this chair, that couch, and the lamp over there, in sequence. You grasped the whole room. Actually, you had no choice but to observe and analyze and learn by wholes. After all, you couldn't talk, you couldn't write, and you couldn't read. You could, however, sense, and you could *think*. The thinking you did was not a conscious effort to memorize anything. The thinking you did was connected, integrated, and whole. The thinking you did was also analytical. That is, you learned to make connections among people, places, and things.

Later on, when you started to speak, and after that to read, you didn't memorize letters in a word. You learned words whole, entire, and full of meaning. You developed the ability to string those words into complete thoughts and then into whole sentences.

You made no conscious effort to learn most words by rote, did you? Later on, when adults got into the act, they made you memorize the alphabet. That was not your idea! You preferred to learn another way. At about three years old, you kept asking your favorite question — "Why?" You had the ability to place things and ideas wholly in context without memorizing. This helped you to learn and caused you, over and over again, to ask Why? Why? Why? You kept taking in more whole words with more whole meaning. By the time you were five, grown-ups made you go to school. You started, especially in the fourth grade, to learn by rote memorization. Many classrooms knocked your natural and whole learning instincts right out of you!

Now here you are, some years removed from five years old. You are in a classroom. Both in classrooms and in homework, most teachers cause you to learn mainly by rote. Topics are presented to you in sequence. The topics lack connections and context. You find rote learning not only boring but tiresome as well. Rote learning is difficult, stressful, and offers little emotional and intellectual reward. You are often not sure why you are studying something and what it all means. Learning by rote places you at a severe disadvantage now and in the future. Rote learning prevents you from gaining a critical understanding of the subject matter you study. You study one topic after another and never get to see how they are all connected. You are often unaware of the purposes served by what you study. You learn the "nose, " "eyes," and "mouth" of subject matter. Unlike in your childhood, you never get to see the "whole face" of subject matter. Rote learning causes you to be intellectually inactive, and it does not motivate you to want to learn more. Rote learning makes no music. In short, rote learning is awful. If you hate it, good for you!

It's time to be that five-year-old analytical self, again. You were born with the ability to observe, relate, and make sense of the world around you. You were born with the ability to analyze. You still have, and will always have, the ability to analyze. To analyze means to really get into a topic and see why it is important and why you want to care about it. Welcome to Whole Learning! Whole Learning is a strategy based on arranging subject matter according to an analytical theory and in a critical framework. Whole Learning is *not* about how to arrange chairs or students in a classroom, whether or not to use a portfolio or go on a field trip. Whole Learning is about how to think, analyze, and understand whole meaning. With Whole Learning, you use your natural analytical ability in *all* your courses. No longer will you feel learning and studying to be a tiresome, unrewarding exercise.

For those of you who are good at rote learning, don't worry: You may still use it, but you will no longer be at the mercy of dry textbook discussions of subject matter. You will use the same textbooks, but your view of their contents will be changed by what you will learn here. For those who have not developed good rote-learning skills, you are no longer at a disadvantage. Whole Learning will show you how to develop *analytical* skills. Analytical skills are the preferred skills of the world you live in. They are the preferred skills that you must bring to your life and to the 21st century workplace.

Know this: You are already smart! Know that the ability to do well was in-born within you and will always be within you. Know that you can, therefore, succeed in school and college. Whole learning will show you how to draw out, develop, and use the whole and innate analytical thinking and learning abilities that you already possess. Your view of what it means to learn will be radically altered by Whole Learning. You will wonder how you ever survived all your previous classes.

Hello, Analytical Teacher!

Why Is This Book Needed?

Unlike conventional approaches to learning, Whole Learning provides students with an applied, portable, and transferable *intellectual framework* for integrating academic and career/occupational studies. Students learn analytically to think, read, write, listen, speak, and problem-solve within the context of their academic and career subject matter. Students learn to integrate and understand, as examples, the cognitive and applied connections between Lincoln's *Gettysburg Address* and a lab assignment in science, between using a computer and the structure of a play, between solving a math formula for a single variable and the *First Amendment* to the *Bill of Rights,* between the visual arts and the technology of Ohm's law of electricity. Students learn to make lasting connections among the worlds of knowledge, working, living, and achieving. Whole Learning provides students with learner-centered and life-long intellectual and practical thinking and communication abilities. As a consequence, students are better able to apply themselves to the worlds of learning, working, and living.

This book accomplishes the applied integration of academic and occupational studies by addressing directly six strategic issues that other books or learning systems ignore or do not recognize:

1. the difference between a teaching strategy and a teaching technique
2. the learning limitations that are inherent in the sequential presentation of subject-matter topics
3. that the teacher's instructional strategy is the student's intellectual destiny
4. that subject matter is already critical and does not require "critical infusion"
5. that all students are natural analysts
6. that to teach analytically, one must think and plan analytically

Teachers wanting to explore these ideas and the theory and practice of Whole Teaching-Whole Learning through Means-Ends Critical Analysis of Subject Matter can refer to the two following, closely related books:

Maiorana, Victor P., *Critical Thinking across the Curriculum: Building the Analytical Classroom.* Bloomington: ERIC/REC at Indiana University, 1992.

Maiorana, Victor P., *The Analytical Teacher.* Bloomington: ERIC/REC at Indiana University, 1995.

How Whole Learning Is Different from Other Ways to Learn

Whole Learning is different from other ways for these reasons:

(a) Whole Learning sparks analytical learning and study skills.

(b) It treats subject matter critically/analytically rather than sequentially.

(c) It draws on your students' innate analytical skills.

(d) It leads students intellectually, naturally, and seamlessly to critical thinking, reading, writing, listening, speaking, and problem-solving within the context of course content.

(e) It is learner centered.

(f) It provides a critical-thinking framework that students can transfer to every classroom, the workplace, and life.

(g) It allows students to gauge how well they *understand* the material as opposed to simply recalling the facts.

(h) Its critical-thinking framework helps students reconstruct notes taken in the classroom.

(i) It provides the greatest amount of critical learning per unit of time spent studying.

(j) It is the best basis for studying all materials, including textbooks, newspapers, magazines, TV tapes, audio tapes, and computer courseware.

(k) It is fun to use because it makes your students *understand.*

How to Use *The Analytical Student*

This book is divided into five parts: (1) How to Think Analytically, (2) How to Read Analytically, (3) How to Learn Analytically across the Curriculum, (4) How to Write, Listen, and Speak Analytically, and (5) Managing Your College Career. Over 125 analytical explorations introduce, explain, and provide practice in Whole Learning.

If your students are career and technology majors, then use especially these chapters:	If your students are natural science majors, then use especially these chapters:	If your students are liberal arts or social science majors, then use especially these chapters:	If your students represent a mix of majors, then use especially these chapters:
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
10	9	8	8
11	10	9	9
12	12	12	10
13	13	13	11
14	14	14	12
15	15	15	13
16	16	16	14
			15
			16

I gratefully acknowledge the assistance of fellow faculty members and my students who have contributed to portions of this work, including Rose Cavaluzzo, Edward D'Allesandro, Arlene Guadagno, Al Lyskowski, Sidney Sonsky, Alexandra Tarasko, and Susan Traub. Many other names of analytical Whole Teachers and Learners could have been mentioned. Special thanks go to Warren Lewis, ERIC/REC Director of Publications at Indiana University for his dedication to this project, his keen perception of what Whole Learning can and should be, his steadfast help and support, and for his critique of, and contributions to, the manuscript. This book is dedicated to Rosalie, Lauren, Joseph, Michael, and Richard.

Fellow student and colleague in analytical Whole Learning, I wish you the best of good luck as you think, read, write, listen, speak, problem-solve, and imagine your way into the analytical 21st century!

Victor P. Maiorana
City University of New York
Queensborough Community College
1994

Part 1

How to Think Analytically

Chapter 1

Finding the Analytical You

CAN YOU FIND THE SECRET?

Look at this list of words. Study the list for about a minute.

- water
- to provide human energy
- farm
- water the seeds
- a person who eats, gains energy to stay alive
- plant the seeds
- farmer
- pick the food
- seeds
- a person who eats too much can get sick

If you had to, you could memorize this list. Let's see if you can do more than just memorize a list of words.

There is a special way you can look at the list of words. There is a special way that the words are related. See if you can find the secret that is hidden in this list.

See if you can find a special way of looking at the list of items. Take some time now and write down whatever occurs to you. Be as imaginative as you like. Write your comments here:

ARE THESE THE ANSWERS TO THE SECRET?

Here are some of the things you might have done with the list:

1. Make a general statement ("The words are related to growing food.")
2. List the items in alphabetical order, starting with "farmer" and ending with "water."
3. Group similar items (farmer, farm, seeds, water).
4. Draw a picture showing the items.

Perhaps these or other ideas occurred to you. None of them, however, is the secret we are seeking.

A GOOD QUESTION TO ASK

Regardless of what you wrote on page 4, even if you wrote nothing, at least one thought is probably on your mind. That thought is: "There must be a way to learn and study without having to rely strictly on my memory. Otherwise, why was I asked to find a special secret way to look at the list of items?" Good question! Starting with the next chapter, you will begin to learn how to answer this question.

When you learn the secret, your ideas about attending school, going to class, studying, learning, and getting along will be changed forever. You are about to find out that learning does not have to be dull and boring. You are about to find out that learning can be live, active, and challenging, even fun. You are about to find *the analytical you.* You are about to learn how to use all, or the whole, of your intelligence.

Whole Learning means to learn subject matter by understanding and relating all its parts. Whole Learning also means to learn any subject while at the same time developing your thinking, reading, writing, and problem-solving skills. Whole Learning helps you change from being a rote learner to being an analytical learner. Whole Learning will help you to think, read, write, and problem-solve in school, in the workplace, and in life.

When you find the analytical you, you will know for yourself what it means to be a "Whole Learner." To find out the special, secret way to look at that list of items, turn to the next chapter.

Chapter 2

The Secrets of Subject Matter

All human beings are analytical by nature. That means that you are already an analytical person. In this chapter, you will learn to draw on your existing analytical abilities. You will learn Whole Learning strategy. This critical strategy will help you to think, read, write, and problem-solve analytically about new facts and ideas (new subject matter).

Two things happen at the same time when you use the Whole Learning analytical strategy:

1. You learn new subject matter by analyzing it, not by trying to memorize it.
2. You learn to think analytically for yourself, and to read and write analytically about what you study. In other words, you become what is often called a critical thinker and analytical communicator.

Subject matter is anything that you can think about, read about, talk about, or learn. From the way you have been taught in school, you might think that the only way to learn new subject matter is to memorize it. This is not true.

Subject matter — all subject matter — contains four deep, well-kept secrets. When you know the secrets, you will find the analytical you. You will become a much better student and a whole learner. In this chapter, you will learn the four secrets. You will learn how to apply the four secrets to all the subjects that you will ever study.

HERE'S HOW TO THINK ANALYTICALLY

Let's suppose you were asked to learn the words and phrases in our famous list:

- water
- to provide human energy
- farm
- water the seeds
- a person who eats, gains energy to stay alive
- plant the seeds
- farmer
- pick the food
- seeds
- a person who eats too much can get sick

Having been asked "to learn" the list, you would probably try to memorize the list. That's the bad news. The good news is that there is another, better way to look at the list. Let's see what happens when you look at the list in this better, analytical way.

Let's follow these steps:

1. Place a check mark next to the line that starts with the word "to."
2. Look for the lines that contain only one word. Draw a box around each one.
3. Look for the lines that describe actions. Draw a circle around each line.
4. Place an x-mark next to the lines that start with "a person."

Your list should now look like this.

Here is what is special about the words and phrases you have marked:

1. The phrase that starts with the word "to" represents a goal or objective (a purpose).
2. The words you placed in a box are persons, places, or things (nouns).
3. The phrases you circled represent actions or activities (verbs).
4. The phrases you marked with an "x" represent a result (a consequence) of achieving the purpose.

Now let's assemble your markings into a diagram. The diagram is called an *analytical display.* Here is what a blank analytical display looks like:

Analyst: _____ *Date:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of _____

(1) **Purpose** (Why?)

(2) **Resources** (What is needed?)

(3) **Activities** (What is done?)

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

Negative:

Write neatly; print, if necessary; and complete the above display as follows:

1. Enter your name as the analyst.
2. Enter today's date.
3. Enter "The Analytical Student, page 8," source of the raw subject matter.
4. Enter "Food" on the title line.
5. Place the phrase you marked with a check mark under "Purpose."
6. Place the words in boxes (persons, places, or things) under "Resources."
7. Place the words you circled (the actions) under "Activities."
8. Place the phrases you marked with an "x" under "Consequences." You decide which phrase is positive and which phrase is negative.

Here is how your analytical display ought to look now:

The little black circles (bullets) are used to help separate each entry. The bullets make it easier for you to read and understand the display. The bullets also make it easier for anyone who looks at your display to understand what you have written or typed.

Analyst: (your name here) *Date:* (today's date here)

Source of Raw Subject Matter: V. Maiorana, *The Analytical Student,* p. 8.

Title: An Analytical Display of Food

(1) **Purpose** (Why?)
- to provide human energy

(2) **Resources** (What is needed?)
- water
- farm
- farmer
- seeds

(3) **Activities** (What is done?)
- water the seeds
- plant the seeds
- pick the food

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: a person who eats, gains energy to stay alive

Negative: a person who eats too much can get sick

Let's summarize what you have done so far:

SUMMARY: WHOLE LEARNING STRATEGY

1. Topics are not looked at one after the other in sequence. Instead, topics are related analytically. The whole meaning of the subject matter is made clear.
2. You are not relying strictly on your memory to learn. Your native, whole intellect is used. You are not a passive learner. You are an active learner as you think, read, write, organize information, construct meaning, and solve problems analytically.
3. Because the whole of subject matter is brought out and made clear, and because all of your intellect is used, the approach (the strategy) that you have used to analyze the list of food words is called the *Whole Learning strategy.*
4. The list of food-related words represents the raw material of analysis. Until you *analyze* it, all material is *raw.*
5. Whole Learning strategy involves analytical displays.
6. An analytical display has five parts: Title, Purpose, Resources, Activities, and Consequences.
7. After you have a title, analyses *usually* proceed in this order: purpose → resources → activities → consequences. Analyses can, however, proceed in any order, as long as the analytical display ends up with the required five parts.
8. You can develop an analytical display based on what you read. This is what you did with the list of food-related words. First, you read the list and then you developed the display. This is called a *text-based* analysis. You can analyze anything you read. You can analyze your class notes, textbooks, newspaper and magazine articles, and material taken from a computer screen.
9. You can also develop an analytical display without having to read anything. To do this, you think — just think — about a subject you already know something about. This means that you think about some subject that is already in your experience. You then develop an analytical display for it. This is called an *experience-based* analysis.
10. The Whole Learning strategy can be used for *all* of the subjects you study and want to learn about — for the rest of your life.

Here is what is special about the Whole Learning strategy: While it is important to be able to recall facts and ideas, it is more important to be able to think for yourself. You can always find out the facts, but thinking for yourself cannot be found in a book. You can not go to a book and look up what you yourself think. You have to look inside your own brain, for that. Thinking for yourself is *something only you can do.* Thinking for yourself is something that you must do for yourself and by yourself.

You want to be able to think for yourself in the classroom, on the job, in social situations, and in all of life. You live in a complicated world. You must learn to think for yourself so you can protect your interests, the interests of those you love, and the interests of your democratic society. It is more important to be able to think for yourself than merely to remember disconnected bits of meaningless information. It is more important for you to analyze than to memorize.

Learning analytically helps you to become open-minded and fair-minded. It helps you consider other points of view, and avoid being prejudiced. Thoughtful people who possess these traits are said to be *critical* thinkers.

You can also learn the subject matter in all your courses *while you are learning to think analytically.* You can do both things at the same time. Thinking analytically helps you to remember facts and ideas. Thinking analytically brings out the thoughtful person that is already within you. That thoughtful person will always be with you when you think analytically.

EVALUATING AN ANALYTICAL DISPLAY

The Standards

Each analytical display has five windows. This means that each analytical display has a title window, a purpose window, a resources window, an activities window, and a consequences window. The contents of an analytical display must be *correct, complete,* and in *logical order.* When you evaluate an analytical display (your own or someone else's), apply the following standards:

To be *correct,* a window must contain only the type of entries that belong in that window. For example, a resource window needs to contain only persons, places, or things (all nouns), not purposes or activities or consequences.

To be *complete,* each window must contain all the corresponding words and phrases available in the raw material. For example, if there are four resources in the raw material, then the complete resources window will show four entries.

To be in *logical order,* the entries must be arranged properly. In a properly logical arrangement, the connections between and among the entries make sense. For example, the activity "water the seeds" logically follows the activity "plant the seeds."

Application of the Standards

Let's look at, and evaluate, each window in the display shown on page 11.

Title Window

Start the evaluation by making sure that the analysis has a title. The analysis on page 11 does have a title, so we can proceed to evaluate each remaining window.

Purpose Window

This window contains a statement of purpose. Another way to say this is that a purpose identifies an objective, an end-in-view, or a goal to be accomplished. When using the Whole Learning strategy, *all* statements of purpose directly address the subject matter and start with the word "to."

The purpose window on page 11 is correct because it contains a statement of purpose that starts with the word "to." It is complete because it contains all the purposeful statements found in the raw material.

Resources Window

This window contains only persons, places, or things (nouns). Another way to say this is that it contains only the individuals, locations, tools, and ingredients that are needed to accomplish the purpose. List resources in the order they are used in the activities.

The resources window on page 11 is correct because it contains only resources (persons, places, or things). It is complete because it contains all the resources that appear in the raw material.

Activities Window

This window contains only activities (actions). This window always has entries that show that something is going on, that some action is taking place. This window shows that the resources are used in one or more activities to accomplish the purpose. *Always arrange activities in logical order.*

The activities window on page 11 is correct because it contains activities only. It is complete because it uses all the activities in the raw material. However, the activities are not in logical order. Before seeds can be watered, they must first be planted. So the activities should be rearranged in this order: "plant the seeds, water the seeds, pick the food."

Consequences Window

The consequences window contains the likely aftereffects of achieving the stated purpose. Stated another way, a consequence is something that can, will, or may happen

in the future if the purpose is achieved. A consequence is also something that can, will, or may happen in the future if the purpose is *not* achieved. Consequences can be either positive or negative, or both positive and negative. Consequences can be either anticipated or unanticipated. When thinking about consequences, you must always keep the *purpose window* in view. Keep the purpose in mind so you can think of the likely positive and negative consequences of achieving or not achieving the purpose.

The consequences window on page 11 is correct because its contents logically follow from the stated purpose. If the purpose of food is to provide energy, then it logically follows that a person who eats the food can stay alive. Staying alive is a positive consequence. Eating too much food, however, can lead to illness. Getting sick is a possible negative consequence. There are almost always more consequences imaginable than you will have space or desire to list. Go for themes that seem important to you in the context of your thinking about the purpose.

Based on evaluating each window, the analytical display shown on page 11 has been revised. The revised version is shown below. Notice that the activities have been rearranged to show a logical order. Notice also that the resources have been listed in the order in which they are called upon in the activities window.

Analyst: (your name here) Date: (today's date here)

Source of Raw Subject Matter: V. Maiorana, *The Analytical Student,* p. 8.

Title: An Analytical Display of Food

(1) **Purpose** (Why?)
- to provide energy

(2) **Resources** (What is needed?)
- farmer
- farm
- seeds
- water

(3) **Activities** (What is done?)
- plant the seeds
- water the seeds
- pick the food

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: a person who eats, gains energy to stay alive

Negative: a person who eats too much can get sick

WRITING ANALYTICAL NARRATIVES

An analytical narrative is a written version of an analytical display. An analytical narrative contains a series of descriptive sentences and paragraphs that are based on an analytical display. Here is an analytical narrative. It is based on the analytical display on food shown on this page.

AN ANALYTICAL NARRATIVE

Topic: Food

Prepared by (your name goes here when you write a narrative)

The purpose of food is to provide energy to people and other living things. The resources needed to grow food include a farmer, a farm, seeds, and water. The activities involved in growing food include planting the seeds, watering the seeds, and picking the food. A positive consequence of eating food is that a person gains energy and can stay alive. A negative consequence of eating too much food is that a person can get sick.

Notice the following about this narrative:

1. The first sentence is a combination of the analytical display's title and the statement of purpose.
2. The second sentence is based on the resources that appear in the analytical display.
3. The third sentence is based on the activities that appear in the analytical display.
4. The last two sentences are based on the consequences that appear in the analytical display.

You may conclude the following from the narrative above:

- To write analytically, you must first think analytically.
- To help you to think analytically, you develop an analytical display.
- Once you have the analytical display, you can use it as a framework to write analytically.

Analytical narratives are not always written in the order of the analytical display: purpose, resources, activities, and consequences. They do not always have four or five sentences. When you gain confidence in developing analytical displays, you can write the corresponding narrative in any order you choose. Sometimes, while writing a narrative, you may think more thoroughly about the topic under analysis. You may think of additional ideas that are not in the display. When this happens, go ahead and write the material into the narrative, even though it does not appear in the analytical display. When writing analytical narratives, make sure of these two things: (1) Write clearly, concisely, and correctly. (2) Be sure that your narrative includes the four elements of purpose, resources, activities, and consequences.

Let's practice writing a narrative. Write a narrative for the following analytical display. Notice that the display contains a negative consequence if the purpose is not achieved.

Title: An Analytical Display of the Hand

(1) **Purpose** (Why?)
- to hold objects

(2) **Resources** (What is needed?)
- fingers
- palm
- skin
- wrist
- object

(3) **Activities** (What is done?)
- think
- reach
- grasp

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive (if the purpose is achieved): The objects can be used.

Negative (if the purpose is not achieved): Some objects get broken if held too tightly.
Palm gets sweaty and sticky.
Muscles get tired if objects are held too long.

AN ANALYTICAL NARRATIVE

Topic: _____

Written by _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

THE SECRETS OF SUBJECT MATTER

The same four secrets apply to all subject matter. Knowing the secrets is to know that subject matter is not dry, dull, and boring. Subject matter is dynamic, challenging, and can be fun to learn. Here are the four secrets of subject matter:

1. *All* subject matter serves some purpose. A purpose is concerned with the following: (a) why or to what end-in-view some thing or some idea is used, (b) *why* some thing or some idea is considered important, and (c) *why* some thing or some idea is worth spending time with.
2. Once you have identified a purpose, you then think about how to achieve that purpose. To achieve a purpose, you need to identify *resources.* Resources are instrumental means (objects, instruments, tools, people). That is, *resources are what is needed to achieve the purpose.* Resources are always persons, places, or things (nouns).
3. To achieve the purpose, you also need to identify *activities* that will use the resources. Activities are intermediate causes (actions of some kind). That is, *activities are what is done to achieve the purpose.* Activities always involve actions.
4. All purposes give rise to results (consequences). A consequence is *what can happen if a purpose is achieved or is not achieved.* Consequences can be positive and negative, either anticipated or unanticipated.

You can think analytically for all the subjects you study. When you think analytically, you unlock the secrets of subject matter. When you think analytically, you discover your whole analytical self.

USING THE WHOLE LEARNING STRATEGY

The strategy of Whole Learning can be used in high school and college and graduate school. Whole Learning can make all your classes more interesting and valuable than they would be if you did not use Whole Learning.

- ✦ You can use Whole Learning to take and analyze classroom notes.
- ✦ You can study and understand textbooks and other instructional materials by using Whole Learning.
- ✦ You can write term papers that get A's, thanks to Whole Learning.

The Whole Learning strategy can be used in all your academic and professional work. You can use Whole Learning in the humanities, social sciences, natural sciences, technologies, and career areas. By using the strategy in all your studies, you will come to see how all subject matter can be arranged critically and unified intellectually.

Whole Learning is a major key to unlocking the secrets of subject matter. When you use this strategy to learn and study, you change from being a memorizing student to being an analyzing student. It is you, the analytical student, who will think for yourself. It is you, the analytical student, who will become the analytical adult, parent, worker, citizen, and whole person. It is you, the thinking, analytical student who will help to preserve for yourself and others the democratic way of life, the free life in which we think for ourselves.

Three cheers for democracy and thinking! Democracy is the free life. (Cheer!) In the free life, we think for ourselves. (Cheer!) To think for ourselves, we need to be able to think analytically. (Cheer!)

QUESTIONS

1. What is the learning strategy discussed in this chapter called?

2. This learning strategy makes use of a display to show your thoughts. What is this display called?

3. What is subject matter that you have not yet analyzed called?

4. An analytical display has five parts. What is the name of each part?

5. There are two kinds of analysis that we use in Whole Learning, one on material you read and another on material that is already in your mind. What is each type of analysis called?

6. Each window in an analytical display is evaluated for three factors. What are these factors?

7. To be correct, what must a window contain?

8. To be complete, what must each window contain?

9. To be in logical order, what must the entries in a window be?

10. What is an analytical narrative?

11. What is an analytical narrative based on?

12. What are the four analytical secrets of subject matter?

13. What are three ways that you can use Whole Learning in all your studies?

Chapter 3

Analytical Thinking

In this chapter, you will engage in a series of analytical activities. In each activity, you will accomplish the following intellectual feats:

- analysis of ideas using Whole Learning
- arrangement of ideas into an analytical display, i.e., a picture of your thinking.
- evaluation of the analytical display
- use of the analytical display to write an analytical narrative

TEXT-BASED ANALYSIS

All the analytical thinking explorations in this section work in the following way:

1. First, you read a list of words and phrases.
2. Next, you analyze the list, using the Whole Learning analytical strategy.
3. Based on your analysis, you develop an analytical display.
4. Then, you evaluate your analytical display to make sure it is complete, correct, and in logical order.
5. Last, you write an analytical narrative based on your analytical display.

ANALYSIS 3-1: Lighting

Part A: Review the Raw Material

The words and phrases in the following list are all associated with lighting. Look over the words and phrases now.

- a person can read
- light bulb
- turn switch on
- lamp
- person
- a person can move around safely
- electrical outlet
- place bulb in lamp
- to provide light
- lamp switch
- plug lamp into electrical outlet

Part B: Analyze the Raw Material

1. Select the phrase that represents a purpose. Place a check mark next to it.
2. Select the words that represent resources (persons, places, or things). Draw a box around each resource. Resources can be described in more than one word. Notice that the resources "light bulb" and "electrical outlet" have already been boxed for you. Draw boxes around all the remaining resources.

3. Select the phrases that represent activities. Draw a circle around each activity. Notice that the activity "plug lamp into electrical outlet" has already been circled for you.
4. Select the phrases that represent consequences. Place an x-mark next to each.

Part C: Develop an Analytical Display

Use the template below to develop an analytical display. Construct the display by transferring the words and phrases you marked in Part B above into their correct places in the analytical display. *You will have to add a negative consequence because none is given in the raw material.*

Analyst: _____ *Date:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of Lighting

(1) **Purpose** (Why?)

•

(2) **Resources** (What is needed?)

•
•
•
•
•

(3) **Activities** (What is done?)

•
•
•

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

•
•

Negative:

•

Part D: Evaluate Your Own Analytical Display for Correctness, Completeness, and Logical Order

Check each window in the display. Check the title window, the purpose window, the resources window, the activities window, and the consequences window. Check each window for correctness, completeness, and logical order.

To be *correct,* a window must contain only the type of entries that belong in that window. For example, a resource window must contain persons, places, or things (nouns) only.

To be *complete,* each window must contain all its corresponding words and phrases from the raw material. For example, there are four resources in the "lighting" raw material, so the complete resources window will show four entries.

To be in *logical order,* the entries must be properly arranged. The entries can be arranged in chronological (time) order. The entries can also be arranged in the order of causation. In causation arrangements, one activity allows or causes the next activity. For example, the activity "turn switch to *on* position" logically follows the activity "plug lamp into outlet." See page 52 for additional ways to arrange entries.

ANALYSIS 3-2: Write an Analytical Narrative on Lighting

Before attempting to write this narrative, review pages 15-17 on the subject of analytical narratives.

Now write an analytical narrative based on the analytical display that you developed in Analysis 3-1. Write your narrative on page 25.

ANALYTICAL NARRATIVE

Topic: _____

Written by: _____

ANALYSIS 3-3: Sleeping

Part A: Review the Raw Material

The words and phrases in the following list are all associated with sleeping. Look over the words and phrases now.

- bed covers
- get in to bed
- arrange covers and pillow
- to provide body with rest
- tired person
- close eyes
- get out of bed
- wake up
- bed
- fall asleep
- person's energy is restored
- get ready for bed
- pillow

Part B: Analyzing the Raw Material

1. Select the phrase that represents a purpose. Place a check mark next to it.
2. Select the words that represent resources (persons, places, or things). Draw a box around each one.
3. Select the phrases that represent activities. Draw a circle around each one.
4. Select the phrases that represent consequences. Place an x-mark next to each.

Part C: Develop an Analytical Display

Use the template below to develop an analytical display. Construct the display by transferring the words and phrases you marked in Part B into their correct places in the display. You will have to add a negative consequence because none is given in the raw material.

Analyst: _____ *Date:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of Sleeping

(1) **Purpose** (Why?)

•

(2) **Resources** (What is needed?)

•
•
•
•

(3) **Activities** (What is done?)

•
•
•

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

•

Negative:

•

Part D: Evaluate Your Own Analytical Display for Correctness, Completeness, and Logical Order

Evaluate each window in your analytical display. Make sure the contents of each window are *correct, complete,* and in *logical order.*

ANALYSIS 3-4: Write an Analytical Narrative on Sleeping

Before attempting to write this narrative, review pages 15-17 on the subject of analytical narratives.

Now write an analytical narrative based on the analytical display you developed in Analysis 3-3.

ANALYTICAL NARRATIVE

Topic: _____

Written by: _____

ANALYSIS 3-5: Clothing

Part A: Review the Raw Material

The words and phrases in the following list are all associated with clothing. Look the words and phrases over now.

- ✦ select clothing
- ✦ pay for clothes
- ✦ means of transportation
- ✦ identify required size
- ✦ store
- ✦ time
- ✦ to protect the body
- ✦ person can gain confidence in appearance
- ✦ go to store
- ✦ try on clothing
- ✦ decide if clothing is all right
- ✦ money
- ✦ wear clothing
- ✦ to look nice
- ✦ person's body will not get wet in rainy weather or cold in the winter
- ✦ take clothing home

Part B: Analyze the Raw Material

1. Select the phrase that represents a purpose. Place a check mark next to it.
2. Select the words that represent resources. Draw a box around each one.
3. Select the phrases that represent activities. Draw a circle around each one.
4. Select the phrases that represent consequences. Place an x-mark next to each.

Part C: Develop an Analytical Display

Use the template below to develop an analytical display. Construct the display by transferring the words and phrases you marked in Part B above into their correct places in the display below. You will have to add a negative consequence because none is given in the raw material.

Analyst: _____ *Date:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of Clothing

(1) **Purpose** (Why?)

-
-

(2) **Resources** (What is needed?)

-
-
-
-

(3) **Activities** (What is done?)

-
-
-
-
-
-
-

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

-
-

Negative:

-

Part D: Evaluate Your Own Analytical Display for Correctness, Completeness, and Logical Order

Evaluate each window in your analytical display. Make sure that the contents of each window are *correct, complete,* and in *logical order.*

ANALYSIS 3-6: Write an Analytical Narrative on Clothing

Write an analytical narrative based on the analytical display you developed in Analysis 3-5.

ANALYTICAL NARRATIVE

Topic: _____

Written by: _____

ANALYSIS 3-7: The Large Intestine

Part A: Review the Raw Material

The words and phrases in the following list are all associated with the human large intestine. Look the words and phrases over now.

- vitamins are absorbed with water
- large intestine
- blood will not clot
- water
- to absorb vitamin K
- bacteria feed on undigested food material
- large intestine bacteria
- blood can clot
- bacteria produces vitamins K and B
- undigested food material

Part B: Analyze the Raw Material

1. Select the phrase that represents a purpose. Place a check mark next to it.
2. Select the words that represent resources. Draw a box around each one.
3. Select the phrases that represent activities. Draw a circle around each one.
4. Select the phrases that represent consequences. Place an x-mark next to each.

Part C: Develop an Analytical Display

Use the template below to develop an analytical display. Construct the display by transferring the words and phrases you marked in Part B into their correct places in the display below.

Analyst: _____ *Date:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of the Large Intestine

(1) **Purpose** (Why?)

•

(2) **Resources** (What is needed?)

•
•
•
•

(3) **Activities** (What is done?)

•
•
•

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

•

Negative:

•

Part D: Evaluate Your Own Analytical Display for Correctness, Completeness, and Logical Order

Evaluate each window in your analytical display. Make sure that the contents of each window are *correct, complete,* and in *logical order.*

ANALYSIS 3-8: Write an Analytical Narrative on the Large Intestine

Write an analytical narrative based on the analytical display you developed in Analysis 3-7.

ANALYTICAL NARRATIVE

Topic: _____

Written by: _____

ANALYSIS 3-9: Lincoln's *Gettysburg Address*

Part A: Review the Raw Material

The words and phrases in the following list are all associated with President Abraham Lincoln's famous speech. Look the words and phrases over now.

- people
- engaged in civil war
- government of, by, and for the people shall not perish from the earth
- meeting to dedicate a burial ground
- field already dedicated by fallen men
- beliefs (all men are created equal)
- brave men
- testing nation's endurance
- forefathers
- new nation
- to achieve a new birth of freedom
- instead, must have increased devotion to cause
- must resolve that men did not die in vain

Part B: Analyzing the Raw Material

1. Select the phrase that represents a purpose. Place a check mark next to it.
2. Select the words that represent resources. Draw a box around each one.
3. Select the phrases that represent activities. Draw a circle around each one.
4. Select the phrases that represent consequences. Place an x-mark next to each.

Part C: Develop an Analytical Display

Use the template below to develop an analytical display. Construct the display by transferring the words and phrases you marked in Part B into their correct places in the display below. You will have to add a negative consequence because none is given in the raw material.

Analyst: _____ *Date:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of Lincoln's *Gettysburg Address*

(1) **Purpose** (Why?)

•

(2) **Resources** (What is needed?)

•
•
•
•
•

(3) **Activities** (What is done?)

•
•
•
•
•
•

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

•

Negative:

•

Part D: Evaluate Your Own Analytical Display for Correctness, Completeness, and Logical Order

Evaluate each window in your analytical display. Make sure that the contents of each window are *correct, complete,* and in *logical order.*

ANALYSIS 3-10: Write an Analytical Narrative on the *Gettysburg Address*

Write an analytical narrative based on the analytical display you developed in Analysis 3-9.

ANALYTICAL NARRATIVE

Topic: _____

Written by: _____

EXPERIENCE-BASED ANALYSIS

In the first section of this chapter you analyzed printed material. In this section your experiences will provide the raw material.

ANALYSIS 3-11: Home

Part A: Draw on Your Experiences

You already know a great deal about the world you live in. That knowledge resides in your memory. Because the knowledge is already within you, you can analyze the knowledge and reconstruct it to generate new understandings of what you know.

You have been living in a home for many years now. In the following analysis, use the knowledge you have gained about living in a home. Proceed by answering the following questions:

1. What are the purposes of a home? Think of, and write out, at least two purposes. If you can think of more than two, write them out also.

2. What resources are needed to accomplish the purposes you identified in step 1?

3. What activities are needed to accomplish the purposes? Asked another way, what is done with the resources?

4. What positive and negative results can happen if the purposes are achieved? What positive and negative results can happen if the purposes are not achieved? Write one consequence on each line.

If purpose is achieved:

Positive consequence: _____

Negative consequence: _____

If purpose is not achieved:

Positive consequence: _____

Negative consequence: _____

Part B: Develop an Analytical Display

Use the template below to develop an analytical display. Draw the display by transferring the words and phrases you identified in Part A above into their correct places in the display below.

Analyst: _____ *Date:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of a Home

(1) **Purpose** (Why?)

(2) **Resources** (What is needed?)

(3) **Activities** (What is done?)

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive (if purpose is achieved):

Negative (if purpose is achieved):

Positive (if purpose is *not* achieved):

Negative: (if purpose is *not* achieved):

Part C: Evaluate Your Own Analytical Display for Correctness, Completeness, and Logical Order

Evaluate each window in your analytical display. Make sure that the contents of each window are *correct, complete,* and in *logical order.*

ANALYSIS 3-12: Write an Analytical Narrative on Home

Write an analytical narrative based on the analytical display you developed in Analysis 3-11.

ANALYTICAL NARRATIVE

Topic: _____

Written by: _____

ANALYSIS 3-13: Education

Part A: Draw on Your Experience

You have been attending classes for many years. Now use the knowledge you have gained through those experiences in the following analysis. Proceed by answering the following questions:

1. What are the purposes of education? Think of, and write out, at least two purposes. If you can think of more than two, write them out also.

2. What resources are needed to accomplish the purposes you identified in step 1?

3. What activities are needed to accomplish the purposes? Asked another way, what is done with the resources?

4. What positive and negative results can happen if the purposes are achieved? What positive and negative results can happen if the purposes are not achieved? Write one consequence on each line.

If purpose is achieved:

Positive consequence: _____

Negative consequence: _____

If purpose is not achieved:

Positive consequence: _____

Negative consequence: _____

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Part B: Develop an Analytical Display

Use the template below to draw an analytical display. Construct the display by transferring the material you identified in Part A into their correct windows in the display.

Analyst: _____ *Date:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of Education

(1) **Purpose** (Why?)

(2) **Resources** (What is needed?)

(3) **Activities** (What is done?)

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive (if purpose is achieved):

Negative (if purpose is achieved):

Positive (if purpose is *not* achieved):

Negative: (if purpose is *not* achieved):

Part C: Evaluate Your Own Analytical Display for Correctness, Completeness, and Logical Order

Evaluate each window in your analytical display. Make sure the contents of each window are *correct, complete,* and in *logical order.*

ANALYSIS 3-14: Write an Analytical Narrative on Education

Write an analytical narrative based on the analytical display you developed in Analysis 3-13.

ANALYTICAL NARRATIVE

Topic: _____

Written by: _____

LOGICAL THINKING

What is the difference between analytical thinking and logical thinking?

With analytical thinking, you sort things out by identifying and purposefully relating associated ideas. The analytical displays that you developed earlier in this chapter are examples of analytical thinking. Analytical thinking is concerned with obtaining a critical understanding of subject matter.

With logical thinking, you put things together in some proper order according to a perceived pattern or order. The patterns that most concern us here are patterns of time and concept. For example, topics on the subject of history can be arranged chronologically by date. Topics on history can also be arranged by concept in terms of degree of importance of ideas or persons or places or memorable events. Logical thinking is concerned with obtaining an ordered understanding of subject matter.

When you combine analytical thinking with logical thinking, you can achieve a whole understanding of subject matter. Earlier in this chapter, you evaluated analytical displays. You were asked to make sure that the entries in the resources and activities portions of the displays were arranged logically. This is an example of including logical thinking within the analytical framework. No matter how logical an arrangement of ideas may be, however, by itself it can never be an analytical arrangement. Why? Logical arrangements according to time or conceptual order are concerned merely with establishing an ordered pattern. Such logical arrangements of ideas are not concerned with the purposes and consequences served by the orderly pattern.

ANALYSIS 3-15: The Difference between Analytical Thinking and Logical Thinking

Here is a list of words that concern your college career. To explore the difference between analytical thinking and logical thinking, read and think through the list.

- read and analyze textbooks
- establish study schedule
- learning activities
- listen and take notes in class
- choose a college
- register for courses
- complete writing assignments
- planning activities

Part A: Logical Thinking

Suppose we wanted to arrange the list of items logically. To help you along, here are the two main ideas in the list. Complete the following list by placing the remaining items where you think they logically belong:

- Planning Activities

  _____

  _____

  _____

- Learning Activities

  _____

  _____

  _____

Here is how a logical thinker might have completed the list:

- Planning Activities

  choose a college

  register for courses

  establish study schedule

- Learning Activities

  listen and take notes in class

  read and analyze textbooks

  complete writing assignments

The important point here is that the planning items are associated with planning activities, and the learning items are associated with learning activities. Also important is that within each main category, the items have been placed in the order that they would normally occur in time. For example, one must first choose a college before registering for courses.

Part B: Analytical Thinking

An analytical thinker would want to go beyond merely arranging the items by time or order concept. An analytical thinker would want to know: What is the purpose of these

activities? What resources are needed to engage in these activities? What are the likely consequences of engaging in these activities?

Using the Whole Learning approach, a proficient analytical thinker would place the logical list in an analytical context as follows:

Title: An Analytical Display of Attending College

(1) **Purpose** (Why?)
= to graduate with a degree in a chosen field

(2) **Resources** (What is needed?)
- myself
- teachers
- counselors
- librarians
- time
- money
- a college / university

(3) **Activities** (What is done?)
- Planning Activities
  - choose a college
  - select courses
  - establish study schedule
- Learning Activities
  - listen and take notes in class
  - answer and ask questions in class
  - read and study textbooks
  - use library
  - complete writing assignments

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive (if purpose is achieved): Competency, awareness, and flexibility during and after college. Better paying and more challenging job.

Negative (if purpose is not achieved): Probably a lower paying job, not being able to select from among a wide variety of job opportunities, and being liable to disadvantages because of a lack of initial learning skills.

As you can see, placing items in logical order is the end of thinking for the logical thinker, whereas for the analytical thinker, placing items in logical order is the start of thinking.

Logical techniques and patterns have their place. But logical thinking is not analytical thinking. Use this awareness to advantage when you work up lists of information and develop analytical displays.

LOGICAL ARRANGEMENTS

You may take several approaches to show the logical arrangement of ideas and thoughts, including these:

- ✦ dot/dash listings
- ✦ topic outlines
- ✦ stick or family-tree diagrams
- ✦ block diagrams
- ✦ concept webbing

Here is an example of a **dot/dash list** about attending college. This list is expanded from the one used in Analysis 3-15. You will recognize that this is the technique used in the activities window of an analytical display. In this example, the two main ideas are represented by a dot (•); the related (second degree) activities are represented by a dash (-).

• Planning Activities

- choose a college
- choose a curriculum
- select courses
- register for courses
- establish study schedule

• Learning Activities

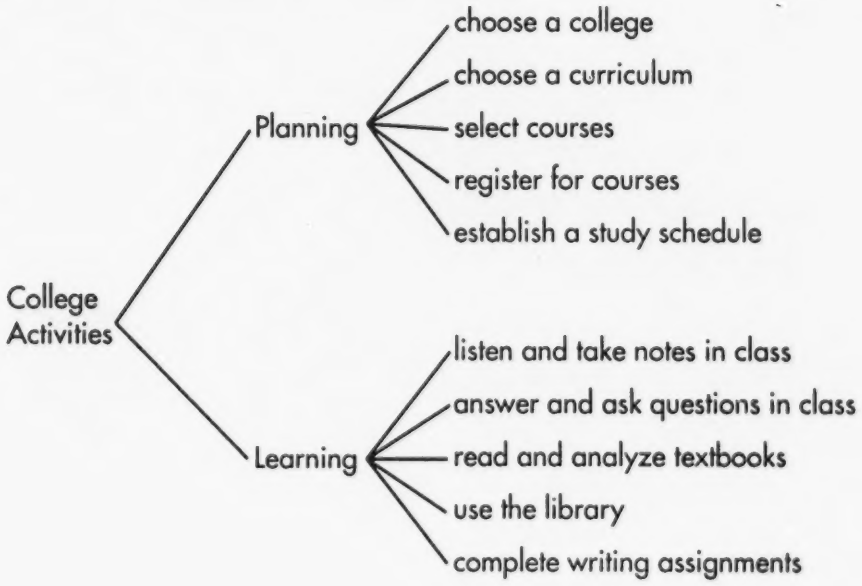
- listen and take notes in class
- answer and ask questions in class
- read and analyze textbooks
- use the library
- complete writing assignments

Here is an example of a **topic outline**. In this example, the two main ideas are represented by Roman numbers, and secondary (subordinate) activities are represented by letters of the alphabet. A third level of activity might be denoted by Arabic numbers (i.e. 1,2, 3).

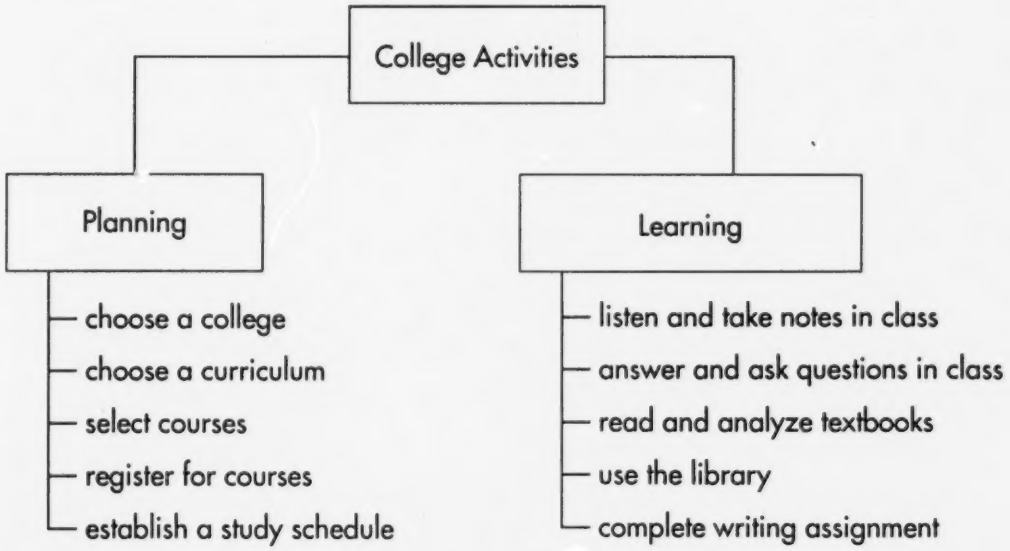
I. Planning Activities
   A. choose a college
   B. choose a curriculum
   C. select courses
   D. register for courses
   E. establish study schedule

II. Learning Activities
   A. listen and take notes in class
   B. answer and ask questions in class
   C. read and analyze textbooks
   D. use the library
   E. complete writing assignments

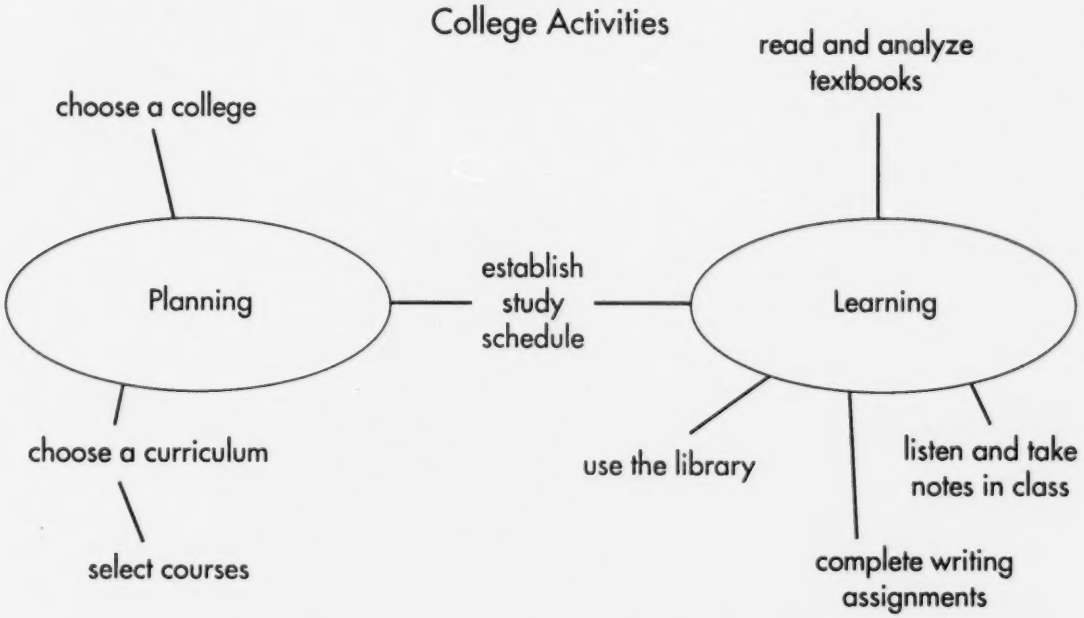
Here is an example of a **stick diagram**:



Here is an example of a **block diagram**:



Here is an example of a **web cluster**:



Remember that the foregoing logical arrangements are concerned with the time/concept order of subject matter and not with how the ideas are analytically related. Only an analytical display or its intellectual equivalent can relate subject matter elements in terms of purposes and consequences.

LOGICAL SEQUENCES

Logical arrangements allow you to mark ideas with dots, dashes, lines, numbers, and letters. *Logical sequences* are concerned with the thinking pattern associated with the ideas that are marked. The most common logical sequences are based on time and concept:

- Temporal (time) Sequence—items are arranged in the chronological order in which they occur.
- Conceptual Classification—items are systematically arranged on the basis of degree of importance in terms of ideas, persons, places, memorable events, or by similarities, differences, and relationships.

ANALYSIS 3-16: Arrange Items Logically

Classify these items in dot/dash format.

counselors
others
college
classrooms
library
teachers
people
study area
places
myself

ANALYSIS 3-17: Arrange Items Logically

Classify these items in stick-diagram format:

counselors
others
college
classrooms
library
teachers
people
study area
places
myself

ANALYSIS 3-18: Arrange Items Logically

Classify these items in block-diagram format.

house of representatives
the people
judicial branch
congressional branch
justice department
the supreme court
the executive branch
federal courts
senate
treasury department

ANALYSIS 3-19: Arrange Items Logically

Arrange these items on the basis of time, using a topic outline format.

Kennedy's *Inaugural Address*
revolutionary documents
The Declaration of Independence
Lincoln's *Gettysburg Address*
The Constitution of the United States of America
presidential speeches

ANALYSIS 3-20: Arrange Items Logically

Show the mutual relationships of these items in a web cluster.

Johnny loves Suzie
Suzie used to love Johnnie
The school dance
Rhonda loves Johnny
Suzie and Rhonda used to be friends
Michael loves both Rhonda and Suzie
Johnny hates Michael
The school's broken punch bowl
Michael's broken nose
Rhonda's broken heart

QUESTIONS

1. What does a statement of purpose represent?

2. What do resources represent?

3. What do activities represent?

4. What do consequences represent?

5. What is a positive consequence? What is a negative consequence?

6. There are always positive and negative consequences associated with a purpose. Explain why.

7. Consequences are still consequences even when they are unanticipated. Explain why.

To answer the following questions, 8 through 13, you need to develop analytical displays. In each case, use the analytical strategy of Whole Learning. This means that each of your analyses (each analytical display that you develop) will have these five parts:

Title

Purpose

Resources

Activities

Consequences (positive and negative)

Don't forget to show your name, the date, and a reference to the source of your raw material at the top of each analytical display.

8. Develop an analytical display for the following list of words and phrases:

players
serve
good body tone and increased stamina
court
keep score
ball
to keep fit through playing tennis
racquets
possible skinned knee or twisted ankle
volley

Evaluate your display to make sure that it is correct, complete, and in logical order.

9. The first stanza in the nursery rhyme "Jack and Jill" is shown below. Develop an analytical display from this raw material.

Jack and Jill went up the hill

to fetch a pail of water.

Jack fell down and broke his crown,

and Jill came tumbling after.

Evaluate your display to make sure that it is correct, complete, and in logical order.

The following questions involve experience-based analyses. Look at Analysis 3-11 on page 38 and Analysis 3-13 on page 42 to remind yourself of the procedure used for developing experience-based analyses.

10. Develop an analytical display on obtaining a part-time job.
11. Develop an analytical display on keeping a part-time job.
12. Develop an analytical display on purchasing an automobile.
13. Develop an analytical display about attending college. Use this as your statement of purpose: "To graduate with a degree in my chosen field."
14. Develop an analytical display on the family.
15. Develop an analytical display on self-esteem.
16. What is the difference between logical thinking that is based on time or concept patterns and analytical thinking that is based on purpose and consequences?
17. Arrange these items in logical order:

    rain

    rivulet (a small stream of water)

    river (a large stream of water)

    brook (a gathering of rivulets)

    clouds

    the sea

Part 2

How to Read Analytically

Chapter 4

How to Read Paragraphs Analytically

Remember Jack and Jill? To analyze the nursery rhyme, does it make any difference to you which way the raw material presented?

This way?

Jack and Jill went up the hill
to fetch a pail of water.
Jack fell down and broke his crown,
and Jill came tumbling after.

Or this way?

Jack and Jill went up the hill to fetch a pail of water. Jack fell down and broke his crown, and Jill came tumbling after.

The answer is no; it doesn't matter in terms of content analysis. No matter in which of the following forms you encounter subject matter, you can still analyze the material:

- a list of words and phrases
- a paragraph or series of paragraphs
- topic headings in a textbook chapter, portions of a chapter, or entire chapters
- a newspaper or magazine article
- your class notes
- text and pictures that appear on a computer screen

Subject matter (content) is subject matter, regardless of its form. Your job as an analyst of subject matter is to understand it critically, logically, and analytically.

In this chapter, you learn to analyze paragraphs. The paragraphs are taken from textbooks and newspaper articles. The paragraphs deal with subject matter in the natural sciences, social sciences, and the humanities.

The activities in this chapter are your opportunity to sharpen your skills at using Whole Learning. You will get sharp on paragraphs with this chapter and get ready to analyze entire textbook chapters in chapter 6.

READING A PARAGRAPH ANALYTICALLY

Here is a procedure for analyzing paragraphs:

1. Read the paragraph through once quickly, but don't skim (don't skip words).
2. Read it again, but this time, involve yourself with it.
3. Place a check mark next to the phrase(s) that represents the purpose of the narrative. If the purpose is not readily apparent, go on to the next step and return to this step later.
4. Draw boxes around words that represent resources (persons, places, or things).
5. Draw circles around phrases that represent activities.
6. Mark with an x the phrases that represent the consequences of achieving the purpose.
7. Make a copy of the blank analytical display in Appendix A or sketch a blank display in your notebook. Enter your name as the analyst, the current date, and enter a title for the analytical display. (Note: Single paragraphs do not usually have titles. You will have to invent a title for your analytical display based on the contents of the paragraph.)
8. Cite the source of your raw material.
9. Transfer the purpose, resources, activities, and consequences from the marked paragraph to the analytical display.
10. Make sure that the analytical display is correct, complete, and in logical order. Revise as necessary.

ANALYSIS 4-1 Analyze a Paragraph on Biology

A. Apply steps *1 through 6* to the paragraph cited below:

1. Read the paragraph through once quickly, but don't skim (don't skip words).
2. Read it again, but this time, involve yourself with it.
3. Place a check mark next to the phrase(s) that represents the purpose of the narrative. If the purpose is not readily apparent, go on to the next step and return to this step later.
4. Draw boxes around words that represent resources (persons, places, or things).
5. Draw circles around phrases that represent activities.
6. Mark with an x the phrases that represent the consequences of achieving the purpose.

Mark and draw, now:

A purpose of the large intestine is to absorb vitamin K. The resources needed to accomplish this purpose include the large intestine, undigested food material, large intestine bacteria, and water. The activities include the feeding of bacteria on undigested food material, the production of vitamins K and B by the bacteria, and the absorption of the vitamins with water. If vitamin K is produced, the blood can clot. If vitamin K is not produced, the blood will not clot.

B. Compare your marked narrative to this one, and make corrections as necessary.

A purpose of the large intestine is to absorb vitamin K. The resources needed to accomplish this purpose include the large intestine, undigested food material, large intestine bacteria, and water. The activities include the feeding of bacteria on undigested food material, the production of vitamins K and B by the bacteria, and the absorption of the vitamins with water. If vitamin K is produced, the blood can clot. If vitamin K is not produced, the blood will not clot.

7. Make a copy of the blank analytical display in Appendix A or sketch one in your notebook. Enter your name as the analyst and the current date. Enter "The Large Intestine" on the title line.
8. Enter the author's name, the title of this book, and p. 61 as the source of your raw material.
9. Transfer the purpose, resources, activities, and consequences from the marked paragraph to the analytical display.
10. Make sure the analytical display is correct, complete, and in logical order. Revise as necessary.

Does your analytical display look like this?

Analyst: (your name) Date: (today's date)

Source of Raw Subject Matter: V. Maiorana, *The Analytical Student,* p. 61.

Title: An Analytical Display of the Large Intestine

(1) **Purpose** (Why?)
- to absorb vitamin K

(2) **Resources** (What is needed?)
- large intestine
- undigested food material
- large intestine bacteria
- water

(3) **Activities** (What is done?)
- bacteria feed on undigested food material
- bacteria produce vitamins K and B
- vitamins are absorbed with water

(4) **Consequences** (What can happen if purpose is/is not achieved?)
- Positive: blood can clot
- Negative: blood will not clot

Making this analysis was probably fairly easy for you. This is because the paragraph was written in the order Purpose-Resources-Activities-Consequences (P-R-A-C). Paragraphs do not, however, have to follow the P-R-A-C order for you to be able to analyze them easily. The following paragraph does not present the material in the P-R-A-C order. You will nonetheless be able to apply the Whole Learning strategy.

ANALYSIS 4-2: Analyze a Paragraph on Immunology

A. Apply steps *1 through 6* to the paragraph shown below:

1. Read the paragraph through once quickly, but don't skim (don't skip words.
2. Read it again, but this time, involve yourself with it.
3. Place a check mark next to the phrase(s) that represents the purpose of the narrative. If the purpose is not readily apparent, go on to the next step and return to this step later.
4. Draw boxes around words that represent resources (persons, places, or things).
5. Draw circles around phrases that represent activities.
6. Mark with an x the phrases that represent the consequences of achieving the purpose.

In May of 1796 [Dr. Edward Jenner] selected an eight-year-old boy and inoculated him with 'matter taken from the sore hand of a dairymaid.' The next day the boy became ill—fever, headache, loss of appetite—but the following day he was completely well again. Several months later, Jenner inoculated the child with 'matter' taken from a smallpox pustule. The child was protected; no disease occurred. The experiment was a success, and the human species (and their domestic animals) began to secure the protection of immunization.

B. Compare your marked narrative to this one, and make corrections as necessary.

In May of 1796 [Dr. Edward Jenner] selected an eight-year-old boy and inoculated him with 'matter taken from the sore hand of a dairymaid.' The next day the boy became ill—fever, headache, loss of appetite—but the following day he was completely well again. Several months later, Jenner inoculated the child with 'matter' taken from a smallpox pustule. The child was protected; no disease occurred. The experiment was a success, and the human species (and their domestic animals) began to secure the protection of immunization.

7. Make a copy of the blank analytical display in Appendix A or sketch one in your notebook. Enter your name as the analyst and the current date. Enter "The Immunization Passage" on the title line.
8. Enter "R. S. Desowitz, *The Thorn in the Starfish*. New York: W. W. Norton & Company, 1987, p. 24" as the source of your raw material.
9. Transfer the purpose, resources, activities, and consequences from the marked paragraph to the analytical display.
10. Make sure the analytical display is correct, complete, and in logical order. Revise as necessary.

Does your analytical display look like this?

Analyst: (your name) Date: (today's date)

Source of Raw Subject Matter: R. S. Desowitz, *The Thorn in the Starfish.* New York: W. W. Norton & Company, 1987, p. 24.

Title: An Analytical Display of the Immunization Passage

(1) **Purpose** (Why?)
- to protect the boy from disease

(2) **Resources** (What is needed?)
- Dr. Edward Jenner
- dairymaid
- "matter" from maid's sore hand
- eight-year-old boy
- smallpox pustule

(3) **Activities** (What is done?)
- boy inoculated with "matter" from dairymaid's hand
- boy became ill
- boy recovered the next day
- boy later inoculated with "matter" from smallpox pustule
- no disease occurred in the boy

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: Human species and domestic animals gained the protection of immunization.

Negative:

This kind of analysis makes written material — including textbook subject matter — come alive. No longer is information-learning just a recitation of names and dates. The purpose, means, and consequences inherent in the information has been portrayed analytically, graphically, and dynamically.

Not all passages contain the four basic parts of a Whole Learning analysis. Reasonably complete and well-written paragraphs usually contain at least the elements of purpose, resources, and activities. The immunization paragraph you have analyzed is particularly well formed. The paragraph includes not only elements of purpose, resource, and activity but also positive consequences as well. The display lacks a negative consequence, however. Can you think of one? If so, add it to the display.

HOW TO DEVELOP STATEMENTS OF PURPOSE

Here is an idea about *purpose* for you to think over. Written material serves at least two purposes. These purposes are (1) the purpose *of the author,* and (2) the purpose *of the subject matter* that the author is describing.

In the immunization passage, the author's purpose was to describe Dr. Jenner's experiment. But what is the purpose of the *subject matter* being described? Since the main topic of the paragraph is immunization, the statement of purpose must deal with immunization. Notice, therefore, that the statement of purpose directly addresses immunization.

In Whole Learning analysis, a statement of purpose such as "to talk about immunization" or "to learn about the paragraph," or "to learn about immunization," is almost never appropriate. A purposeful statement must *directly address* the subject itself, the subject matter, the topic itself being analyzed. A statement of purpose must be drawn *from within* the subject matter itself, and not be foisted upon the subject matter by the analyst. Statements of inherent purpose are necessary and most effective for initiating and sustaining analytical thought.

ANALYSIS 4-3: Identify Statements of Purpose

Here is a list of statements on three different topics. For each topic, place a check mark next to the statement that you think is purposeful. Look *at the topic,* then decide which statement better captures the purpose inherent *within the topic.*

Topic: *Fractions*

1.___ To understand and calculate fractions

2.___ To represent a numeric value less than 1

Topic: *Computers*

1.___ To help the reader to understand the use of computers

2.___ To increase one's ability to do intelligent work

Topic: *Digestive System*

1.___ To cause the student to understand the human body's digestive system

2.___ To extract nutrients from food

In all three cases, the second line tells the purpose inherent within the subject matter. In all three cases, the first line tells *about* the subject matter *indirectly.* In all three cases, the first line is not a statement of the subject matter itself. When developing analytical displays, you want your statements of purpose to read like the three second lines. The three second lines are all statements of purpose that deal *directly* with the subject matter.

ANALYSIS 4-4: Analyze Some Paragraphs on Earth Sciences

Use the following newspaper article to teach yourself how to find statements of purpose. Develop *one* analytical display for all *three* paragraphs. (Source of Raw Material: *The New York Times,* October 22, 1991, Science Section, page 7).

Lightning and Trees

"It isn't so much that lightning loves trees as that it loves things that are: (a) tall; (b) the tallest thing in the vicinity; and (c) conduct electricity," said Dr. Allan Friedman, director of the New York Hall of Science in Queens.

"A single tree in the middle of a golf course meets all these standards," he said. "It is not terribly tall, but it is the tallest thing around," he said. "It is all by itself, and the moisture in the tree, underneath the bark in the form of sap, is a pretty good conductor of electricity."

"Lightning is static electricity," Dr. Friedman said. "The bottoms of clouds accumulate a large excess of electricity that needs to escape," he said, "and one route is cascading down to the surface of the earth in a lightning bolt. Whatever point is handiest, like a nice damp tree, is a good place for a discharge to take place," he said.

The following information will help you develop the analytical display. Two statements of purpose might be made in connection with this article:

1. (The purpose of *the article* is) to show why lightning is attracted to trees.
2. (The purpose of *lightning* is) to allow static electricity to escape [to be discharged].

Both purposes appear in the article. The first purpose is in the title of the article: *to describe how lightning is attracted to trees.* The second purpose (that is, the purpose of lightning) is found in paragraph 3, sentence 2: *to allow large amounts of static electricity to escape.* The article is primarily about purpose #1. If it were primarily about purpose #2, a much more technical discussion involving chemistry, electricity, and cloud types would likely have been presented.

Which of these two purposes should you use? Use them both. As a general rule, use all the purposeful statements you can find. List them in the order you think important.

HOW TO DEVELOP CONSEQUENCES

Here is an idea about *consequences* for you to think about. All purposes have consequences. There are *always* consequences. Said another way, there are consequences that go along with *anything you set out to analyze* or *anything you set out to do.* While you may accomplish your purpose, you also have to deal with the consequences. Consequences may be good (positive) or bad (negative), anticipated or unanticipated.

If you think hard enough, you can always identify both positive and negative consequences. Some consequences may not be especially important, but they are always present. Here are some examples of positive and negative consequences when the purpose is achieved:

Purpose	Positive Consequence	Negative Consequence
• to obtain a college degree	• become a thoughtful person, better preparation for job market	• frustration if person graduates into poor job market
• to own a car	• independent travel	• cost of payments, insurance, and upkeep
• to protect the boy from disease	• boy is immunized	• boy may get disease

Considering consequences is another way that Whole Learning raises the intellectual excitement of your learning efforts. Look at the analytical display on page 66. The original analysis does not contain a negative consequence. The immunization paragraph includes consequences, but only positive ones. The paragraph does not state what might have gone wrong if Dr. Jenner's experiment had failed. Did Dr. Jenner act ethically when he injected the boy? What if the injection had resulted in the boy's having a severe reaction to the inoculation that led to serious illness or death? *Further, the paragraph does not state what a negative consequence might be even if the inoculation were a success.* The boy could be left with pock marks on his skin. Negative consequences can usually be identified if you put yourself in the place of others and if you think through the situation.

Here is the analytical display on the hand from chapter 2. The display now includes both positive and negative consequences of both achieving and not achieving the purpose.

Title: An Analytical Display of the Hand

(1) **Purpose** (Why?)
- to hold objects

(2) **Resources** (What is needed?)
- brain
- fingers
- palm
- skin
- wrist
- object

(3) **Activities** (What is done?)
- think
- reach
- grasp

(4) **Consequences** (What can happen if purpose is/is not achieved?)

If the purpose is achieved:

Positive: Objects can be used.

Negative: Some objects get broken if held too tightly. Palm gets sweaty and sticky. Muscles get tired if the object is held too long.

If the purpose is not achieved:

Positive: A dangerous object (e.g., a hot plate) cannot inflict pain. Object (e.g., a snowflake) will not break if held too tightly.

Negative: The object is not held. Intended use of the object (e.g., a hammer) is not accomplished. Object (e.g., a butterfly) is left free.

Not all written material will address both kinds of positive and/or negative consequences. *However, this does not prevent you from thinking about all possible consequences.* This is one of the major features of Whole Learning: You start to think about possible consequences. Whole Learning prompts you to look down the road, to see

if a desired or proposed purpose is worth the possible consequences. Thinking about consequences is one mark of a thoughtful person.

When you consider consequences, keep the following in mind:

1. You can think about (a) the positive consequences of achieving a purpose and (b) the negative consequences of achieving a purpose. For example, if one's purpose is to own an automobile, then a positive consequence is independent travel, and negative consequences are payments, insurance, upkeep, and parking hassles.
2. You can think about (a) the positive consequence of *not achieving* a purpose and (b) the negative consequence of *not achieving* a purpose. For example, if your purpose is to own an automobile, then a positive consequence of not achieving the purpose (of not owning an automobile) is less air pollution, and a negative consequence is the restrictions on your travel.
3. The consequences in the standard analytical display format assume that the purpose *is achieved* ["(4) **Consequences** (What can happen if purpose is/is not achieved?)"]. If you add consequences that address *not achieving* the purpose, then you must make this clear in your display.

ANALYSIS 4-5: Identify Consequences

Here are some statements of purpose. Imagine at least one likely positive consequence and one negative consequence that is liable to happen. Start by thinking about a positive and negative consequence of achieving the purpose. If nothing comes readily to mind, think about the a positive and negative consequence of *not achieving* the purpose.

Purpose	Positive Consequence	Negative Consequence
• to own an automobile	•	•
• *not* to own an automobile	•	•
• to work with computers	•	•
• *not* to work with computers	•	•
• to attend college	•	•
• *not* to attend college	•	•

ANALYZING MATERIAL IN DIFFERENT SUBJECT AREAS

So far in this chapter, you have analyzed material in the natural sciences. In this section you analyze material from the social sciences, the humanities, and some career areas.

ANALYSIS 4-6: Analyze a Paragraph on Computers

Develop an analytical display for the following paragraph. Apply the same procedure you used in Analyses 4-1 and 4-2.

> The computer is a contemporary, hi-tech machine. The computer can help a person do intelligent work. A computer can also handle large amounts of data. A computer is a machine that can be programmed to store, retrieve, and process data. While a computer cannot solve problems by itself, it helps people operate productively.

ANALYSIS 4-7: Analyze a Paragraph on Cost Accounting

Develop an analytical display for the following paragraph. Apply the same procedure you used in Analyses 4-1 and 4-2. The source of the raw material is *Cost Accounting*, page 201.

> **Job Order Costing**
>
> Under a job order costing system, the three basic elements of cost — direct materials, direct labor, and factory overhead — are accumulated according to assigned job numbers. The unit cost for each job is obtained by dividing the total units for the job into the job's total cost. A cost sheet is used to summarize the applicable job costs. Selling and administrative expenses, which are based on a percentage of manufacturing cost, are listed on the cost sheet to arrive at total cost.

ANALYSIS 4-8: Analyze Some Paragraphs on Health Sciences

Develop an analytical display for the following two paragraphs. Apply the same procedure you used in Analyses 4-1 and 4-2. Develop one analytical display for both paragraphs. The source of the raw material is D. Hales, *An Invitation to Health,* 4th ed. Benjamin Cummings Publishing Co., 1989, p. 386.

Passive Smoking

Maybe you don't smoke — never have and never will. That doesn't mean you don't have to worry about the dangers of smoking, especially if you live or work with people who do smoke. Even without lighting a match, you may be a *passive smoker.*

On the average, a smoker inhales what is known as *mainstream smoke* 8 or 9 times with each cigarette, for a total of about 24 seconds. However, the cigarette burns for about 12 minutes, and everyone else in the room breathes in what is known as *sidestream smoke.* Sidestream smoke is even more hazardous than mainstream smoke: According to the American Lung Association, it has twice as much tar and nicotine, 5 times as much carbon monoxide, and 50 times as much ammonia. Researchers have found that if you are a nonsmoker sitting next to someone smoking seven cigarettes an hour, even in a ventilated room, you will take in almost twice the maximum amount of carbon monoxide set for air pollution in industry — and it will take hours for the carbon monoxide to leave your body.

ANALYSIS 4-9: Analyze a Paragraph on Communications

In the absence of logic, reaching agreements, solving problems, and existing in the world is difficult, if not impossible. People do respond, however, to many factors: cultural differences, vested interests, and use of vocabulary. Here is a paragraph about why logic must be accompanied by sensitivity to people. (Source of Raw Material: S. I. Hayakawa, *Language in Thought and Action,* 2nd ed. New York: Harcourt Brace Jovanovich, 1964.)

> The belief that logic will substantially reduce misunderstanding is widely and uncritically held, although, as a matter of common experience, we all know that people who pride themselves on their logic are usually, of all the people we know, the hardest to get along with. Logic can lead to agreement only when, as in mathematics or the sciences, there are pre-existing, hard-and-fast agreements as to what words stand for. But among our friends, business associates, and casual acquaintances — some of them Catholic and some Protestant, some of them no-nonsense scientists and some mystics, some sports fans and some interested in nothing but money — *only the vaguest of linguistic agreements exist.* In ordinary conversation, therefore, we have to learn peoples' vocabularies in the course of talking with them — which is what all sensible and tactful people do, without even being aware of the process.

ANALYSIS 4-10: Analyze a Paragraph on History

Develop an analytical display for the following paragraph. Apply the same procedure you used in Analyses 4-1 and 4-2. (Source of raw material: *The Autobiography of Benjamin Franklin.* New York: Pocket Books, Inc.).

About this time [while working in a printing shop] I met with an odd volume of the *Spectator*. It was the third. I had never seen any of them. I bought it, read it over and over, and was much delighted with it. I thought the writing excellent, and wished, if possible, to imitate it. With this view I took some of the papers, and, making short hints of the sentiments in each sentence, laid them by a few days. (Then) without looking at the book, (I) tried to complete the papers again, by expressing each hinted sentiment at length, and as fully as it had been expressed before, in any suitable words that came to hand. Then I compared my *Spectator* with the original, discovered some of my faults, and corrected them....I also jumbled my collection of hints into confusion, and after some weeks endeavored to reduce them into the best order, before I began to form full sentences and complete the paper. This was to teach me method in the arrangement of thought.

QUESTIONS

1. Written material serves at least two purposes. What are they?

2. In Whole Learning, statements of purpose are concerned primarily with the purpose of the subject matter being analyzed. Why?

3. When considering consequences, an analyst can think about achieving the stated purpose or _____ _____ the stated purpose.

4. What are the four kinds of consequences possible in a purpose?

5. Develop an analytical display for the following paragraph drawn from the United States' *Declaration of Independence.* Be prepared to add consequences if you cannot find them in the paragraph. [Reference: *Harvard Classics:* American Historical Documents, v. 43, P. F. Collier and Son Company, New York, 1910, p. 150]

> When in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the Powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to separation.

6. Develop an analytical display for the following paragraph drawn from Martin Luther King Jr.'s speech, *I Have a Dream*. Be prepared to add consequences if you cannot find them in the paragraph. [*A Testament of Hope — The Essential Writings of Martin Luther King, Jr.* J. M. Washington, (ed.), Harper and Row, San Francisco, 1986, pp. 217-220.]

   With this faith we will be able to work together, to pray together, to struggle together, to go to jail together, to stand up for freedom together, knowing that we will be free one day. This will be the day when all of God's children will be able to sing with new meaning — "my country 'tis of thee; sweet land of liberty; of thee I sing; land where my fathers died, land of the pilgrims' pride; from every mountain side, let freedom ring" — and if America is to be a great nation, this must be true.

7. Develop an analytical display for the following paragraph drawn from a health textbook. Be prepared to add consequences if you cannot find them in the paragraph. [Reference: D. Hales, *An Invitation to Health,* 4th ed. Benjamin Cummings Publishing Company, 1989, p. 167.] Note: this paragraph is written in the context of exercising outdoors during cold weather.

   Following are some suggestions for coping with wintry weather. Protect yourself by covering as much of your body as possible, but don't overdress. Wear one layer less than you would if you were outside but not exercising. Don't use warm-up clothes of waterproof material because they tend to trap heat and keep perspiration from evaporating. Make sure your clothes are loose enough to allow movement and exercise of the hands, feet, and other body parts, thereby maintaining proper circulation. Choose dark colors that absorb heat. Because 40 percent or more of body heat is lost through your head and neck, wear a hat, turtleneck, or scarf. Even a towel wrapped around your neck provides some protection. Make sure you cover your hands and feet as well. (Mittens provide more warmth and protection than gloves.)

8. Develop an analytical display for the following paragraph drawn from a sociology textbook. Be prepared to add consequences if you cannot find them in the paragraph. [Reference: J. M. Shepard, *Sociology.* West Publishing Company, 1981, p. 272.]

   Who lives where? In the case of the nuclear family, a married couple lives with neither set of parents and establishes a new residence of their own. Such a residential arrangement is a *neolocal* one. Extended families, of course, have different residence norms. A *patrilocal* arrangement calls for living with the husband's parents. Residing with the wife's parents is expected under a *matrilocal* arrangement.

Chapter 5

Techniques that Support Analytical Reading and Studying

READING

You read books, newspapers, and magazines to enjoy yourself and to find specific information. Reading for enjoyment provides aesthetic pleasure, can be intellectually stimulating, and it is a good use of time.

Approaches to Reading

Read each of the following statements. Write "A" for agree or "D" for disagree in the space provided.

1.___ It is not necessary to read every word in a sentence to understand its meaning.

2.___ There is something wrong with you if you don't understand subject matter on the first reading.

3.___ The slower you read, the better you understand.

4.___ The faster you read, the better you understand.

5.___ Speed reading is essential for school and college survival.

6.___ Reading a text and studying a text are the same thing.

You should have disagreed with all of the statements. Here's why:

Skimming Does Not Work

If you skim a sentence, you may not understand it. Leaving out just one word in a sentence can destroy its meaning. Try leaving out the words (one at a time) in the following sentence:

You may not understand a sentence if you skim it only.

What happens to the thought when key words like *not* and *skim* are left out? The meaning of the sentence is destroyed when key words are not read. You cannot tell whether a word is a key word until it has first been read in context with all the other words.

If you don't read all the words in a sentence, you will not get the whole thought. You may even get the wrong thought. Skimming is therefore a waste of time. Skimming leads to confusion about the subject matter and promotes anxiety regarding your attempts to learn.

Re-reading

There's nothing wrong with you if a sentence or paragraph or chapter is not clear the first time you read it. You will put undue pressure on yourself if you adopt this self-critical attitude. Understanding difficult ideas and concepts comes with time and thoughtfulness. Difficult subject matter requires more effort, more study, more re-reading. Furthermore, the appearance of opinions and facts in any writing, as in a textbook, does not mean that the writing is free of confusion or error. The material you read may be poorly organized or awkwardly written or quite mistaken. Never believe anything merely because it's in print or in an audiotape or in a videotape or on a computer screen. If you have trouble understanding a topic, find other resources in a library. Put together the viewpoints of several authors, and you gain excellent understanding.

Reading Speed

If your teacher sudd - en — ly st - art - ed sp - e - ak - in - g v -e - r - y s- l - o - w - l - y, you would probably fall asleep. Reading involves listening to yourself. So you may fall asleep if you read very slowly. You will bore and tire yourself.

Chances are that you now read too slowly. Chances are that you can increase your reading speed if you make a special effort. The special effort involves the use of a few simple techniques faithfully applied. Before discussing how to increase your reading speed, let's establish your present reading rate.

ANALYSIS 5-1: Your General Reading Rate

Read the following selection at your normal reading speed. Do not try to speed up or slow down. Just read normally. Time yourself in minutes and seconds.

Out in the Cold

Lucinda was very young and she was crying. As she left the building, the cold New England air tried to freeze the tears on her cheeks. She thought about the meeting. The president of the college and his advisors had found her more than qualified. Her appearance, her manner, her speech, her religiousness, her intellectual ability — all were excellent. She was just the

kind of college student they were seeking. She was fine in every way except one: She was of the wrong gender. That final phrase kept echoing in her head: "Sorry, Miss Foote, but we cannot admit you to the freshman class of Yale University."

Back in 1783, when Lucinda Foote was denied entrance to Yale College, it created a problem not easily fixed. Back then (about the time of the American Revolution), there were only nine colleges in all the United States. The first of these had been Harvard, founded in 1636 by English immigrants. So there were not many places where Lucinda could apply. (There weren't many students attending the nine colleges; probably fewer than one thousand.) Lucinda couldn't commute, as many students now do because colleges were few and far between. George Washington commuted to school by riding a horse and then rowing a boat.

If there were only nine colleges in 1783, there were even fewer fields of study. A student had little from which to choose. A person who played a large part in developing colonial colleges was King George III of England. In 1762 (before the American Revolution of 1776), King George wrote a letter to wealthy people in England. He asked that they send money to support the colleges in America. Among the reasons he cited for this support were to instill just principles of religion, to instill loyalty to England, and to instruct in branches of useful knowledge. As it turned out, these were the basic curricula that then existed. A colonial college student could major in one of three fields. The choice was basically to study religion and become a minister, study general knowledge and become a gentleman, or study both and become a teacher.

So Lucinda was confronted with an educational system that offered little choice. It was a system organized and run by men whose furthest thought was that women belonged in college. What if Lucinda were somehow able to apply to college today? What kind of choices would she have? By about 1860, the nine colonial colleges with about 1,000 students had grown to 250 colleges and 50, 000 students. Today there are over 3,000 colleges attended by over 14 million students. So Lucinda wouldn't have much trouble finding a college she liked.

Fields of study are no longer limited to the ministry, general study, and teaching. Today's student can choose from many areas of study. The choices include advertising art and design, automotive technology, business administration, computer science, information systems, nursing, fine and applied arts, law, engineering, medicine, and many more. Some colleges offer as many as 35 different fields of study. Lucinda would be sure to find something that matched her interests and aptitudes. If she were to find herself *out in the cold* today, it would be because she was studying forestry, civil

engineering, or construction technology. A woman today can choose any field. She is limited only by her imagination.

Record your reading time here:

_____ minutes and _____ seconds.

The article contains 650 words. Calculate your reading rate according to the following table: For example, if your time is 3 minutes, then your reading rate is 217 words per minute. If your exact time is not shown, round it to the nearest half-minute. For example, if your time is 3 minutes and 10 seconds, use 3 minutes; if your time is 3 minutes and 15 seconds, use 3 minutes and 30 seconds; if your time is 3 minutes and 20 seconds, use 3 minutes and 30 seconds; and if your time is 3 minutes and 45 seconds, use 4 minutes.

Time in Minutes and Seconds	Reading Rate
zero minutes and 30 seconds	1300 words per minute
1 minute	650 wpm
1 minute and 30 seconds	450 wpm
2 minutes	325 wpm
2 minutes a. ' 30 seconds	260 wpm
3 minutes	217 wpm
3 minutes and 30 seconds	186 wpm
4 minutes	163 wpm
4 minutes and 30 seconds	144 wpm
5 minutes	130 wpm
5 minutes and 30 seconds	118 wpm
6 minutes	108 wpm
6 minutes and 30 seconds	100 wpm
7 minutes	93 wpm
7 minutes and 30 seconds	87 wpm
8 minutes	81 wpm
8 minutes and 30 seconds	76 wpm
9 minutes	72 wpm
9 minutes and 30 seconds	68 wpm
10 minutes	65 wpm

Here are some simple techniques to increase your general reading speed:

Make a Conscious Effort

You can increase your reading speed by at least ten percent merely by telling yourself to speed up. That may sound unlikely to you, but remember that gold-winning Olympians concentrate their attention and effort and thereby gain both skill and speed. They tell themselves to win. "Try harder!" isn't the answer to everything, but it is the place to start to up your reading rate. A definite commitment to increasing your reading speed, helps.

Avoid Vocalizing and Sub-vocalizing

If you read out loud or move your lips without producing sound, you are almost certainly limiting yourself to a maximum reading rate of around 200 words per minute. Most people, even if they don't move their lips, "pronounce" the words in their minds — they subvocalize. If you break the vocalizing habit, you will automatically achieve a speed increase. If you increase your speed, you will automatically break the vocalization habit. This is because you will have eliminated the time it takes to move your lips, tongue, and teeth. Subvocalizing is a habit that can be changed, too. See a reading instructor or go your school's reading lab, but start on your own by using your hand!

Use Your Hand as a Pacer

Reading machines and computer programs have been invented to show you several words at a time: The words are exposed for a short period of time. Then a new group of words is exposed, followed by another group, and so on, all in rapid order. These machines, moving faster than your lounging brain and slow eyes, force you to read faster and faster. With practice, you can increase your reading speed with these machines and computer programs.

But there's a better reading tool than a computer — your own hand. You can't carry computers and reading machines around with you to read your textbooks, but you always have your hands. Use your hand to underline quickly and smoothly each line as you read. Start by grouping your fingers with your thumb tucked slightly under the other fingers. Then, with your middle finger leading the way, move your hand across the page. Do not drag a single finger alone across the page; use all four. In this manner your hand becomes a pacer for your eyes. Move your hand at a slightly faster pace than your normal reading rate. This will cause your reading speed to increase.

Taking in information is one thing; analyzing and understanding it is something else. You can read faster and faster until you become a speed-reader. Some material, however, is inappropriate for speed-reading — poetry, for example. Other material is perfect for speed-reading — newspapers, for example. Many novels, and some textbooks and tradebooks fall somewhere in between. For reading highly complex and detailed material, speed-reading teachers counsel their students to *slow down* to 100 words per

minute or less. One famous speed-reading course spends about one-fourth the time showing students how to study — *at reduced reading rates!* The hurricane of page-turning you see advertised on television for speed-reading courses and speed-reading computer software can be misleading, if you assume that *difficult* material is being read at that rate.

It is important to recognize that we have been discussing how to increase your general reading rate, not how to speed-read a textbook. You cannot speed-read and learn analytically. Speed-reading has little, if anything, in common with what it means to learn and study material analytically.

Summary of Ideas on Reading

- ✦ You cannot read if you cannot see properly. Be aware of the health of your eyes. Eyes change. Have them checked at least once a year, or whenever you feel discomfort.
- ✦ Skimming a sentence (skipping over some words) is a bad idea.
- ✦ You cannot understand a thought unless you first read and understand the words that express the thought.
- ✦ If you have access to a reading laboratory at your school, be sure to take advantage of it. Your reading ability will be appraised and help will be provided. Resist efforts that teach you to speed-read textbooks.
- ✦ No matter how quickly you read, you will have to slow down when you encounter new subject matter or difficult subject matter. With practice, you will know when to speed up or slow down. You have a built-in guide: your sense of whether or not you understand the material as you analyze it.
- ✦ Read as much as you can, including newspapers and magazines. Familiarity with more words and ideas will increase your confidence and willingness to read.
- ✦ Your real interest in reading is in learning the subject matter effectively and efficiently.

STUDYING

You study class notes, textbooks, and other materials so that you may understand and apply subject matter. When you study, you make a special effort to attach meaning to what you read and to develop application skills in the subject matter. Studying prepares you for exams, for work, and for critical thinking for the rest of your life. What you are doing here is developing your lifelong ability to think, read, and write analytically.

Do You Know the Difference between Memorizing and Understanding?

Memorizing

You memorize so you can recall information. Memorizing is accomplished through repetition. With a good memory, you can recall the information at a later date and perhaps use the information to help solve problems. Learning by rote (learning strictly by repetition) does not, however, require that you understand what you memorize. If you do not understand something, then that means you cannot explain it, apply it, or transfer its meaning to another context.

Here is an example: Look at this formula: $y = mx + b$. If I were to ask you to memorize this formula, you could easily do so. If on a test I asked you: "What is the formula you were asked to memorize ?" then you could easily respond "$y = mx + b$. "

So you've memorized a formula — so what? Does it mean that you know that it is the formula to draw a straight line? Does it mean that you understand what y, m, x, and b represent? Does it mean that you can apply the formula and draw a straight line? Does it mean that you can evaluate the results of drawing a straight line?

It *can* mean all of these things, but often it doesn't. When someone says that they have learned something, they often mean that they have merely memorized it. Memorizing and understanding so as to learn and know are not the same thing.

To learn means that you have understood and can now apply your new information and knowledge. If this is so, then memorizing is not truly learning. At best, memorization is the lowest form of learning.

Understanding and Learning

You study to understand and apply — to learn. You learn through analysis, application, and evaluation. Understanding requires that you attach meaning to what you read and do. What does it mean to say that you have learned something? You have learned subject matter when you can do the following:

- Recognize the purposes served by the subject matter.
- Analyze the means through which those purposes are achieved.
- Evaluate the consequences of achieving the purposes.
- Apply the subject matter in a meaningful way.

Here is what one would say or write to demonstrate *analytical learning* of the formula y = mx + b:

> The purpose of the formula "y = mx + b" is to allow one to draw a straight line.
>
> The resources needed to draw a straight line include m (the coefficient of x), b (the y-intercept), values for x, the ability to make substitutions in an equation, graph paper, a pencil, and a straight edge. To develop a straight line, one must (1) substitute each x value into the equation to obtain the corresponding y value, (2) write each answer as ordered pairs of x and y values, (3) plot the x and y values as points on graph paper, and (4) connect the points to reveal the straight line.
>
> With straight lines, engineers can design machines and bridges, architects can design buildings, and scientists can pursue the discovery and development of new knowledge.

Have you recognized this as a narrative version of a Whole Learning analytical display? As you can see, the understanding and learning involved in this description of a straight line is a long way from merely memorizing "y = mx + b." This is a demonstration of authentic learning. This is a demonstration of analytical learning. This is a demonstration of Whole Learning.

Locate Topic Headings

A topic heading often provides a link to the purpose of the paragraph that follows the topic heading. A topic heading in a textbook chapter is like a newspaper headline. As in a headline, a topic heading provides a brief idea as to the content of the paragraphs that follow.

For example, and starting with the chapter title of this chapter, the main topic headings in *this* chapter are: TECHNIQUES THAT SUPPORT ANALYTICAL READING AND STUDYING, READING, STUDYING, and CONCLUSION. Topic headings are often easy to identify because they (a) often occupy their own line, (b) usually are in capital letters, (c) typically stand out in some way through use of color, position, type style, or size.

ANALYSIS 5-2: Locate Topic Headings

On the lines that follow, write down the page numbers in *this* chapter on which the following topic headings appear.

I. ____ TECHNIQUES THAT SUPPORT ANALYTICAL READING AND STUDYING

II. ____ READING

III. ____ STUDYING

IV. ____ CONCLUSION

The four headings listed above are called *main headings*. Textbooks often have sub-headings in addition to main headings. On the lines that follow, write down the page numbers on which appear the main headings and sub-headings in *this chapter*. Do not count the analyses as topic headings.

I. ____ STRATEGIES THAT SUPPORT ANALYTICAL READING AND STUDYING (chapter title)

II. ____ READING

A. ____ Approaches to Reading

1. ____ Skimming Does Not Work
2. ____ Re-reading
3. ____ Reading Speed
4. ____ Make a Conscious Effort
5. ____ Avoid Vocalizing and Subvocalizing
6. ____ Use Your Hand as a Pacer

B. ____ Summary of Ideas on Reading

III. ____ STUDYING

A. ____ Do You Know the Difference between Memorizing and Understanding?

1. ____ Memorizing
2. ____ Understanding and Learning

B. ____ Locate Topic Headings

C. ____ Locate Topic Sentences

IV. ____ CONCLUSION

A. ____ Reading

B. ____ Studying

V. ____ QUESTIONS

As we discussed in chapter 3, the above list represents *logical* thinking. To view the main ideas in this list analytically, see p. 114.

Locate Topic Sentences

A topic sentence expresses the main idea of a single paragraph. Stated another way, a topic sentence is the sentence that states the purpose of the paragraph. A topic sentence is that sentence which analytically holds together all the other elements in a paragraph. A topic sentence is that sentence which provides the basis for arranging all the elements in a paragraph within the purpose - resources - activities - consequences framework. Topic sentences are a great idea in non-fiction, informational writing, and textbooks. Be advised, however, that not everyone writes topic sentences, especially not in literature and often not in essays.

Topic sentences can appear anywhere in a paragraph, or not at all. A topic sentence can be the first sentence in a paragraph, a sentence in the middle of a paragraph, or the last sentence in a paragraph.

Recognize that you have already been learning to think, write, and read purposefully. You have already been practicing how to locate topic sentences. The following analyses are no different from other analyses, such as those in chapter 4, in which you were asked to find the purpose of a paragraph. Here, then, is your next chance to identify purposeful statements.

ANALYSIS 5-3: Locate the Topic Sentence

Here is a paragraph from Martin Luther King's speech "I Have a Dream." Read the paragraph and identify the sentence that states the purpose of the paragraph. In other words, identify the topic sentence and write it in the space below.

> With this faith we will be able to work together, to pray together, to struggle together, to go to jail together, to stand up for freedom together, knowing that we will be free one day. This will be the day when all of God's children will be able to sing with new meaning— "my country 'tis of thee; sweet land of liberty; of thee I sing; land where my fathers died, land of the pilgrims' pride; from every mountain side, let freedom ring" — and if America is to be a great nation, this must be true.

(a) ***The topic sentence:*** Here, the topic sentence is the first sentence. Specifically, it is that portion of the first sentence that states: "...knowing that we will be free one day," which is equivalent to saying "...to be free."

(b) ***Supporting analysis:*** Now watch the analysis unfold: To be free, we need these resources: faith, people ("we"), God's children, America. We need to engage in these activities together: work, pray, struggle, go to jail, stand up for freedom. If we use the resources and engage in the activities, then the consequences will be the following: (1) "This will be the day when all of God's children will be able to sing with new meaning — 'my country, 'tis of thee; sweet land of liberty; of thee I sing; land where my fathers died, land of the pilgrims' pride; from every mountain side, let freedom ring', " and (2) America will be a great nation.

ANALYSIS 5-4: Locate the Topic Sentence

Read the paragraph and identify the sentence that states the purpose of the paragraph. In other words, identify the topic sentence and write it in the space below.

Following are some suggestions for coping with wintry weather. Protect yourself by covering as much of your body as possible, but don't overdress. Wear one layer less than you would if you were outside but not exercising. Don't use warm-up clothes of waterproof material because they tend to trap heat and keep perspiration from evaporating. Make sure your clothes are loose enough to allow movement and exercise of the hands, feet, and other body parts, thereby maintaining proper circulation. Choose dark colors that absorb heat. Because 40 percent or more of body heat is lost through your head and neck, wear a hat, turtleneck, or scarf. Even a towel wrapped around your neck provides some protection. Make sure you cover your hands and feet as well. (Mittens provide more warmth and protection than gloves.) (From: D. Hales, *Introduction to Health,* 4th edition. Redwood City: The Benjamin/Cummings Publishing Company, 1989, chapter 7— "The Joy of Fitness: Exercising and Resting," p. 167.)

(a) Enter the topic sentence here:

(b) Support your topic-sentence choice by writing an analysis here:

CONCLUSION

Reading

Reading newspapers and magazine articles is general reading. When reading for enjoyment or for information, you engage in general reading. What happens, however, when you must *learn* (understand) what you read? Your reading attitude changes. The material can still be a pleasure to read, but your purpose for reading changes.

Studying

Merely reading words in a textbook will not produce analytical learning. You need to reconstruct the material using an analytical framework. The Whole Learning Strategy is such a framework. As we have seen, merely reading or memorizing words and ideas is not analytical learning. When analytical learning is your objective, other activities, not just straight or general reading, are necessary. What are these activities? They are the same activities that you have already been practicing in chapters 1 through 4. These activities have helped turn you from one who reads subject matter passively into one who studies (learns/understands) subject matter actively.

When your purpose is to learn, when you read to learn, you are studying. The difference between reading and studying is a big difference.

- Would you rather look at a photograph of people white-water rafting down the Colorado River, or be on the raft yourself?
- Would you rather watch a basketball game on television, or play the game yourself?
- Would you prefer to be a passive reader of subject matter, or an active analyst of subject matter?

QUESTIONS

1. Describe why skimming a sentence is a bad idea.

_____

_____

_____

2. What are three things you can do to increase your reading rate?

_____

_____

_____

3. Describe the difference between memorizing and understanding.

4. Describe the difference between reading and studying.

5. What is a topic heading?

6. What is a topic sentence?

Chapter 6

How to Read Textbooks Analytically

In chapters 3, 4, and 5, you learned to read short passages analytically. In this chapter, you will use the same Whole Learning strategy to read entire textbook chapters analytically.

You can use the procedure in Table 6-1 to analyze textbooks. You can use the procedure the first time you look at a chapter. You do not need any prior knowledge of the topics contained in a chapter to start thinking and analyzing. With the Whole Learning strategy, you accomplish these major feats of learning:

1. You think analytically the very first time you encounter new subject matter.
2. You focus on the purposes served by the subject matter.
3. You develop an organized basis for preparing written versions of the material analyzed. This is especially helpful when your instructor assigns you to prepare written reports.
4. You evaluate the quality of the material you are reading. Written material may be considered incomplete in the extent to which it lacks elements of purpose, resources, activities, and consequences. When you become aware of what's lacking, you, the reader/analyst, gain a critical basis for evaluating both the completeness and the fair-mindedness of the presentation. You know what information and ideas you yourself, the thinker, may want to supply.

HOW TO READ TEXTBOOK CHAPTERS ANALYTICALLY

You can use the following procedure for learning the material in chapters of any textbook. You do not need prior knowledge of the topics discussed in a chapter to start thinking about, and analyzing, the contents of a chapter.

You can use this procedure the first time you look at any chapter to develop a first-order analytical display. A first-order analytical display takes the major ideas in a chapter and arranges them in accord with a Whole Learning analytical display.

TABLE 6-1
ANALYTICAL READING

1. Select a chapter in a textbook. Its contents are your raw material.
2. Read only the *main* topic headings in the chapter. Start with the title of the chapter and read only the *main* topic headings as you leaf through from page to page.
3. Open your notebook to a blank page on both the left and the right.
4. On the left-hand notebook page, write down each main heading and the *first* sentence that follows each heading. Leave a margin on the left side of the page. Underline each main heading to help separate it from the sentences that follow.
5. Analyze the first topic heading only and mark it up for elements of purpose, resources, activities, and consequences. Check-mark purposes, box resources, circle activities, and x-mark consequences. Make notations in the margin of your notebook page as to purpose, resource, activity, or consequence. If you have trouble identifying an item as either purpose, resource, activity, or consequence, place a question mark next to that item.
6. Repeat step 5 for the remaining main *topic headings.*
7. Now go back and repeat step 5 for all the *first sentences* associated with each main topic heading.
8. On the right-hand notebook page, sketch out a blank analytical display. Enter your name as the analyst, the date, and cite your textbook and the chapter you are analyzing as the source of your raw material. Develop a title for your display.
9. Transfer your analytical findings of purpose, resources, activities, and consequences from the left-hand page to the analytical display on the right-hand page.
10. If you can find no consequences in what appears in your notes, they will not be in your analytical display. In such cases, analyze additional sentences and use your ability to reflect on the consequences of achieving or not achieving the stated purpose. Identify at least one positive and one negative consequence and enter them in your analytical display.
11. Make sure that the analytical display is correct, complete, and in logical order. Revise as necessary.

Nothing prevents you from analyzing the first *two* sentences, or even the whole paragraph under each main topic heading. If fact, with some textbook chapters, you may have to analyze additional text material to complete a first-order analytical display.

Nothing prevents you from analyzing the sub-headings associated with each main heading. In fact, with some textbook chapters, you may have to analyze additional headings to complete a first-order analytical display.

ANALYSIS 6-1: Analyze a Typical Textbook Chapter

Below is a gathering of the main topic headings and the first sentence for each topic heading from F. Mauser & D. Schwartz, *American Business,* 6th edition. New York: Harcourt Brace Jovanovich, 1986, chapter 19 — "Computers: The Electronic Side of Business," pp. 561-589. The main headings appear in bold type to separate them from the sentences that follow. This page will serve as our raw material.

Computers: The Electronic Side of Business, Multiplying Efficiency (chapter title)

What Is a Computer? (first topic heading)

The computer is an amazingly efficient tool that increases our capacity to do intelligent work and handle masses of data.

How Old Is Data Processing?

Data processing—the classifying, sorting, calculating, summarizing, recording, and reporting of factual information—is not a new function.

What Are the Basic Advantages of Computers?

Computers owe their great popularity to their ability to increase business efficiency.

How Are Computers Used?

Computers are now commonplace for preparing payrolls, billing customers, processing payments, keeping track of inventory, and providing a variety of production and sales reports; and people find new uses for computers each year.

What Is Computer Hardware?

Hardware refers to the physical components that make up a computer installation.

What Is Computer Software?

Software refers to the programs that give the computer its instructions.

What Do Systems Analysts and Computer Programmers Do?

The systems analyst is the person who decides what a computer will do and how it will be done.

Where Is the Industry Headed?

The computer industry has evolved faster and in more directions than any other in history.

Now we will do the steps presented in Table 6-1 on p. 94. The first 11 steps in Table 6-1 will be illustrated on the remaining pages of this chapter. You will be actively involved in completing each step. Each step will be followed by **instructions to you in bold type.**

Step 1. Select a chapter in a textbook (the raw material). **We have selected Chapter 19 from *American Business.***

Step 2. Read only the *main* topic headings. In the actual book, the main topic headings appear on different pages throughout the chapter. For purposes of this exercise, they are gathered together on one page. **Go back to page 95. Start with the title of the chapter. Read only the main topic headings.**

Step 3. Open your notebook so there is a blank page on the left and a blank page on the right. **Do it now.**

Step 4. On the left-hand notebook page, write down each main heading and the *first* sentence that follows each heading. Underline each main heading to help separate it from the sentences that follow. **Copy all the material from page 95 to your left-hand notebook page. Leave some space in the left margin. Do it now.**

Step 5. Using your handwritten notes from Step 4, look at the first *topic heading* only and analyze it for elements of purpose, resources, activities, and consequences. As you learned to do in chapters 1 through 4, check-mark purposes, box resources, circle activities, and x-mark consequences. Make notations in the margin as to purpose, resource, activity, or consequence. If you have trouble identifying an item as either purpose, resource, activity, or consequence, place a question-mark next to that item. **Do it now. Analyze and mark the first heading that you wrote out (the chapter title).**

Step 6. Repeat step 5 for the remaining main topic headings on page 95. **Do it now.**

When step 6 is completed, your handwritten material should appear as shown on page 97.

On page 97 in the left margin, observe that each main topic heading has been identified as either purpose, resource, activity, consequence, or with a question mark. A question mark is used if the topic heading under analysis is so general or so abstract or so unclear that it is difficult to classify as either purpose, resource, activity, or consequence.

Analyzing Topic Headings Only

Resource — Computers: The Electronic Side of Business, Multiplying Efficiency

Resource — What is a Computer?

The computer is an amazingly efficient tool that increases our capacity to do intelligent work and handle masses of data.

? (heading too abstract) — How Old is Data Processing?

Data processing—the classifying, sorting, calculating, summarizing, recording, and reporting of factual information—is not a new function.

? (heading too abstract) — What Are the Basic Advantages of Computers?

Computers owe their great popularity to their ability to increase business efficiency.

? (heading too abstract) — How Are Computers Used?

Computers are now commonplace for preparing payrolls, billing customers, processing payments, keeping track of inventory, and providing a variety of production and sales reports; and people find new uses for computers each year.

Resource — What Is Computer Hardware?

Hardware refers to the physical components that make up a computer installation.

Resource — What Is Computer Software?

Software refers to the programs that give the computer its instructions.

Resources — What Do Systems Analysts and Computer Programmers Do?

The systems analyst is the person who decides what a computer will do and how it will be done.

? (maybe consequence because it refers to future) — Where Is the Industry Headed?

The computer industry has evolved faster and in more directions than any other in history.

Step 7. Repeat step 5 for all the *first sentences* associated with each main topic heading. **First look at the examples on this page. Then go to your handwritten material and analyze and mark each sentence in a similar manner.**

Here is the first sentence that you wrote out. Practice on this sentence. Check-mark purposes, box resources, circle activities, and x-mark consequences, as you learned to do in chapters 1 through 4.

The computer is an amazingly efficient tool that increases our capacity to do intelligent work and handle masses of data.

Here is how the sentence may be analyzed and marked. Transfer these markings to your left-hand notebook page.

The computer is an amazingly efficient tool that increases our capacity to do intelligent work and handle masses of data.

Here is the second sentence that you wrote out. Practice on this sentence. Check-mark purposes, box resources, circle activities, and x-mark consequences, as you learned to do in chapters 1 through 4.

Data processing—the classifying, sorting, calculating, summarizing, recording, and reporting of factual information—is not a new function.

Here is how the sentence may be analyzed and marked. Transfer these markings to your handwritten material.

Data processing—the classifying, sorting, calculating, summarizing, recording, and reporting of factual information—is not a new function.

Continue to analyze and mark each of the remaining sentences that you copied from page 95. When finished, your page should look more or less like page 99.

Analyzing Topic Headings and First Sentences

Resource	Computers: The Electronic Side of Business, Multiplying Efficiency
Resource	What Is a Computer?
Resource Purpose	The computer is an amazingly efficient tool that increases our capacity to do intelligent work and handle masses of data.
? (heading too abstract)	How Old Is Data Processing?
Activities Activities + Resource	Data processing – the classifying, sorting, calculating, summarizing, recording, and reporting of factual information – is not a new function.
? (heading too abstract)	What are the Basic Advantages of Computers?
Purpose	Computers owe their great popularity to their ability to increase business efficiency.
? (heading too abstract)	How Are Computers Used?
Activities Activities Activity	Computers are now commonplace for preparing payrolls, billing customers, processing payments, keeping track of inventory, and providing a variety of production and sales reports; and people find new uses for computers each year.
Resource	What Is Computer Hardware? Hardware refers to the physical components that make up a computer installation.
Resource	What Is Computer Software? Software refers to the programs that give the computer its instructions.
Resources	What Do Systems Analysts and Computer Programmers Do? The systems analyst is the person who decides what a computer will do and how it will be done.
? (maybe consequence because it refers to future) Consequence	Where Is the Industry Headed? The computer industry has evolved faster and in more directions than any other in history.

Step 8. On the right-hand notebook page, sketch out a blank analytical display. Enter your name as the analyst, the date, and cite your textbook and the chapter you are analyzing as the source of your raw material. **Enter the following as the source of your raw material:** F. Mauser. & D. Schwartz, *American Business,* 6th edition. New York: Harcourt Brace Jovanovich, 1986, Chapter 19 — "Computers: The Electronic Side of Business," pp. 561-589.

Step 9. Transfer your analytical findings of purposes, resources, activities, and consequences from the left-hand page to the analytical display on the right-hand page. **Do it now.**

When you complete step 9, your handwritten analytical display should look more or less like the one shown below. **If it doesn't, modify it as necessary.**

Analyst: (your name) *Date:* (today's date)

Source of Raw Subject Matter: F. Mauser, & D. Schwartz, *American Business,* 6th edition. New York: Harcourt Brace Jovanovich, 1986, Chapter 19 -"Computers: The Electronic Side of Business," pp. 561-589.

Title: An Analytical Display of Computers in Business

(1) **Purpose** (Why?)
- to do intelligent work
- to handle masses of data
- to increase business efficiency

(2) **Resources** (What is needed?)
- computer
- hardware (physical components)
- software (programs that provide instructions)
- analysts
- programmers
- data
- information

(3) **Activities** (What is done?)
- classify information
- sort information
- calculate information
- summarize information
- record information
- report information
- prepare payrolls
- bill customers
- process payments
- track inventory

(4) **Consequences** (What can happen if purpose is/is not achieved?)
Positive: Computer industry has developed quickly and in many directions.
Negative:

As you develop an analytical display, keep in mind that you are not trying to memorize the chapter material. With Whole Learning strategy, two types of learning are taking place at the same time. You are learning the subject matter in the chapter (in this

case, computers), and at the same time you are learning to think analytically and evaluatively about the subject matter. The ability to do this kind of thinking will be of great service to you in all your academic subjects, in the workplace, and in life. You are learning not only so that you can pass a test but also so that you may understand and know.

Step 10. If you can find no consequences in what appears in your notes, they will not be in your analytical display. In such cases, analyze additional sentences and use your ability to reflect upon the consequences of achieving or not achieving the stated purpose. Identify at least one positive and one negative consequence and enter them in your analytical display.

The display on p. 100 contains one positive consequence that was drawn from the raw material; however, the chapter material contains no negative consequences. Use your imagination and general awareness to generate some possible negative consequences and enter them in the analytical display.

Drawing upon what you may already know about a subject (in this case, computers), you might come up with the following negative consequences associated with computers, consequences that are not in the chapter:

> Workers can lose jobs, loss of human touch, personal information easily made available to strangers, feeling that people don't have to think for themselves since a computer can/will think for them.

Add these or other negative consequences to your handwritten analytical display now.

Another way to identify negative consequences is to think about what could happen if the purposes are *not* achieved. For example, one purpose of the computer is to multiply efficiency [in essence, to save time]. Suppose that a computer system were poorly designed. Suppose that the computer system actually decreased efficiency. Suppose that more time, not less time, were taken to complete business tasks. This could happen for many reasons, but at this point you only have to consider the possibility of its happening.

If a computer decreased efficiency by adding time to tasks, perhaps the firm's customers would be kept waiting for long periods of time on the telephone. A company's billing statements would be sent out incorrectly and/or late. Maybe the inventory report would be so outdated as to be useless. Maybe customer payments would go unrecorded for long periods. These are all examples of negative consequences that, in many cases, *you may be able to discover for yourself* by asking yourself: "If the purpose is *not achieved,* what could happen?

Step 11. Make sure that the analytical display is correct, complete, and in logical order. Revise as necessary. **For this step, go along with the discussion that follows. When you have finished reading the material associated with this step, revise your handwritten analytical display to reflect the display shown on page 103.**

In this step we evaluate the analytical display on page 100 (or your handwritten one).

Title Window: Be sure that the analysis has a title. The one on page 100 does have a title. (If the analysis in your notebook does not have a title, add one now.)

Purpose Window: The purpose window is correct because it contains statements of purpose that start with the word "to." It is complete because it contains all the purposeful statements found in the raw material.

Resources Window: The resources window is correct because it contains only resources (persons, places, or things). It is complete because it contains all the resources that appear in the raw material.

Activities Window: The activities window is correct because it contains only activities. It is complete because it uses all the activities in the raw material. The activities are *not*, however, in the best logical order. For example, the activities can be grouped by category. The first category deals with general activities (classify, sort, calculate, and so on). The second category deals with specific activities (prepare payrolls, bill customers, and so on).

Consequences Window: The consequences window is correct because its contents can logically follow from the stated purposes. No negative consequences are shown. By adding the negative consequences generated in Step 10, the consequences window becomes complete. When thinking about consequences, keep looking *through* the purpose window.

Using the foregoing evaluation and suggestions for improvement, we revise the analytical display shown on page 100 to obtain the display shown on page 103.

Analyst: (your name) *Date:* (today's date)

Source of Raw Subject Matter: F. Mauser & D. Schwartz, *American Business,* 6th edition. New York: Harcourt Brace Jovanovich, 1986, Chapter 19 — "Computers: The Electronic Side of Business," pp. 561-589.

Title: An Analytical Display of Computers in Business

(1) **Purpose** (Why?)
- to do intelligent work
- to handle masses of data
- to increase business efficiency

(2) **Resources** (What is needed?)
- computer
- hardware (physical components)
- software (programs that provide instructions)
- analysts
- programmers
- data
- information

(3) **Activities** (What is done?)

General Activities
- classify, sort, calculate, summarize, record, and report information

Specific Activities
- prepare payrolls
- bill customers
- process payments
- track inventory

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: Computer industry has developed quickly and in many directions.

Negative: (not in chapter) Workers can lose jobs, loss of human touch, personal information easily made available to others, feeling that people don't have to think for themselves since a computer can/will think for them.

WRITING ANALYTICAL NARRATIVES

In preparing an analytical display, you gain an active, dynamic, and analytical understanding of text material. You can reinforce that understanding by writing analytical narratives. Writing narratives will increase your understanding of the material. Writing narratives will also increase your general writing skills.

You were first introduced to writing analytical narratives in chapters 2 and 3. Information about writing analytical narratives from there is repeated here for your convenience.

An analytical narrative is a written version of an analytical display. Here is the procedure for writing an analytical narrative:

1. Prepare an analytical display.
2. On a sheet of paper, write the title of your narrative, such as: "An Analytical Narrative on Computers in Business." Then write your name below the title.
3. Turn each analytical display window into one or more sentences.
4. Write the narrative in this order: purpose(s), resources, activities, consequences.
5. As you write, add material that you sense to be appropriate, even if the material is not in the analytical display.

ANALYSIS 6-2: Write an Analytical Narrative on Computers in Business

Think of the following exercise not so much as a fill-in-the-blanks quiz but as a strung-out crossword puzzle. Use the analytical display on page 103 to complete the narrative.

Topic: Analytical Narrative on Computers in Business
Written by:_____

The purposes of business computers are to _____,
_____, and _____.

The resources needed to achieve these purposes include _____,
_____, _____, _____, and
_____.

The activities include general activities and specific activities. The general activities are
_____, _____, _____, _____, and
_____. The specific activities are: _____,
_____, _____, and _____.

The positive consequences of achieving the purposes of a business computer include these:

_____

_____

_____

The negative consequences of achieving the purposes of a business computer include these:

_____

_____

_____

WHOLE LEARNING IS A *SMART* STRATEGY

The nickname for Whole Learning as a study method is SMART.

Be SMART!

- S stands for survey
- M stands for mark
- A stands for analyze
- R stands for review
- T stands for test

By reading chapters 2 through 6, you have already learned the basics of *SMART.* Table 6-1 on p. 94 explains the S, M, A, and R in SMART. To finish spelling SMART, we add T for Test. Here is a summary of SMART.

"Survey" refers to reviewing the main topic headings in a chapter.

"**M**ark" refers to writing down the topic headings and their associated first sentences.

"Analyze" refers to identifying purpose(s), resources, activities, and consequences and developing an analytical display.

"Review" stands for reviewing your analytical display for correctness, completeness, and logical order and writing an analytical narrative.

"Test" stands for thinking your way through the related parts of the display. You can do this on your own, or you can get a study partner to help you. Your partner, holding the analytical display, reads to you the title and one or more of the statements of purpose. You then develop (orally or in writing) the remainder of the display.

In the **T**est step, you are also testing your abilities to "think about thinking." Called metacognitive thinking, this thinking about thinking occurs when you ask yourself questions such as these: "How'm I doing? Am I really getting this? Do I understand what I just read? Can I repeat what I read in my own words? Can I reconstruct what I have read and analyzed so that it will be useful in a different context (for example, an exam, a classroom presentation, a panel discussion)? Can I transfer the meaning of what I have analyzed so that it will make sense in a different context (for example, making sense of life or work by what is learned at school)?"

With SMART you can study textbook chapters and other materials and simultaneously develop your analytical skills in thinking, reading, writing, listening, speaking, and problem-solving.

HOW DOES SMART COMPARE TO OTHER STUDY METHODS?

The SQ3R Method

SQ3R (**S**urvey, **Q**uestion, **R**ead, **R**ecite, and **R**eview) is another method for studying textbook chapters; it was developed by Francis P. Robinson of Ohio State University.

To use SQ3R, you glance over the main topic headings in a chapter (survey), turn each heading into a question (question), read to answer that question while jotting down key ideas as you go along (read), look away from the book and describe what you have just read (recite), and look over your notes (review).

An Improved Version of SQ3R

John Langan realized that SQ3R was limited because it did not ask you to write about what you were reading. Professor Langan improved SQ3R and called it PRWR (Preview, Read, Write, Recite).

Even thus improved, the PRWR system is not wholly appropriate as a study method. Both SQ3R and PRWR encourage you to read topics sequentially. This leads to rote learning because you are not asked to think critically about what you are studying. You are asked to write and remember facts and ideas, but not to understand their relationships and meaning. It is the ability to think critically, not the ability to learn by rote, that you will need in your higher academic pursuits, on the job, in your family, in a democratic society, and throughout your life.

Neither SQ3R nor PRWR attempts to relate topics dynamically. You are not asked to use your innate abilities to think analytically. You are not encouraged to develop, as you study, your ability to think, read, write, listen, and speak critically. Many study skills texts will ask you to rely on SQ3R or one of its variations. You, however, are already too SMART to buy into the rote learning called for in most skills texts. You are already a higher-order analytical-critical thinker. Rote learning is kids' stuff!

A PERFECTED STUDY SYSTEM: SMART

If you could wish for an ideal study system, what would it be? In another words, from your point-of-view as a student, what features would an ideal study system have?

Let me suggest the features shown in the comparison table on pages 107-108:

Study Method Feature	Ideal Method	SQ3R	PRWR	Whole Learning SMART	Your Own Improvements
1. Treats subject matter critically/ analytically rather than sequentially.	Excellent	Poor (treats subject matter as one topic after another in sequential form)	Poor (treats subject matter as one topic after another in sequential form)		
2. Draws on your innate analyitical skills.	Excellent	Poor (encourages you to learn by rote, to memorize)	Poor (encourages you to learn by rote, to memorize)		
3. Leads intellectually, naturally, and seamlessly to critical-thinking skills (helps you to develop understanding, analysis, evaluation, and problem-solving skills).	Excellent	Poor (helps you learn facts)	Poor (helps you learn facts)		
4. Leads intellectually, naturally, and seamlessly to critical reading skills (helps you to determine whether what you read is clear, fair-minded, and complete).	Excellent	Poor (prompts you to accept someone else's truth)	Poor (prompts you to accept someone else's truth)		
5. Leads intellectually, naturally, and seamlessly to critical writing skills (helps you to write in a clear, fair-minded, and complete manner).	Excellent	Poor (all you do is take notes)	Poor (all you do is take notes)		
6. From a physical standpoint, actively involves you in learning.	Excellent	Poor (note-taking)	Poor (note-taking)		
7. From an intellectual standpoint, actively involves you in learning.	Excellent	Poor (sequential, rote-thinking only)	Poor (sequential, rote-thinking only)		
8. Provides a critical-thinking framework that can be transferred to the workplace and to life.	Excellent	Poor (sequential, rote-thinking only)	Poor (sequential, rote-thinking only)		
9. Allows you to gauge how well you *understand* the material, as opposed to merely recalling the material.	Excellent	Poor (encourages repetition of disconnected facts)	Poor (encourages repetition of disconnected facts)		
10. Helps you to develop critical/ analytical skills in listening and speaking.	Excellent	Poor (no listening or speaking)	Poor (no listening or speaking)		
11. Provides a critical-thinking framework for taking notes in the classroom.	Excellent	Poor (encourages sequential note-taking)	Poor (encourages sequential note-taking)		

Study Method Feature	Ideal Method	SQ3R	PRWR	Whole Learning SMART	Your Own Improvements
12. Provides the most amount of critical learning per unit of time spent studying.	Excellent	Poor (encourages rote learning)	Poor (encourages rote learning)		
13. Provides you with a set of notes to use when preparing for tests.	Excellent	Fair (sequential notes for tests of rote learning)	Fair (sequential notes for tests of rote learning)		
14. Provides the basis for studying materials other than textooks (e.g., newspapers, magazines, video tapes, audio tapes, computer software).	Excellent	Poor (designed for use mainly with textbooks)	Poor (designed for use mainly with textbooks)		
15. Is fun to use.	Excellent	Poor (all subject matter is viewed as something to memorize)	Poor (all subject matter is viewed as something to memorize)		

Because it would be *ideal,* the ideal study system would score excellent in all categories. SQ3R and its derivatives do not compare well with the ideal method in the categories shown. This is mainly because their inventors viewed subject matter as something to be memorized (learned by rote).

Once you have used SMART in your studies, enter your own ratings for it in the comparison table. Can you be smarter than SMART? Add your own ideas of the learning method that would be ideal for you in the last column of the chart.

SUMMARY: USING WHOLE LEARNING TO STUDY A TEXTBOOK CHAPTER

In this chapter, you have developed an analytical display and written a narrative that represents all the main ideas in a textbook chapter. Here is a summary of Whole Learning as applied to textbook chapters.

1. In chapters 2 and 3, you learned to analyze individual headings. In chapters 4 and 5, you learned to analyze individual sentences and paragraphs. All you did in this chapter was to combine what you learned to do in chapters 2, 3, 4, and 5.

2. The procedure you used to analyze a sample textbook chapter is called SMART. "S" stands for survey, "M" for mark, "A" for analyze, "R" for review, and "T" for test.

   "**S**urvey" refers to reviewing the topic headings.

   "**M**ark" refers to writing down the topic headings and their associated first sentences.

"Analyze" refers to identifying purpose, resources, activities, and consequences and developing an analytical display.

"Review" stands for reviewing your analytical display for correctness, completeness, and logical order and writing an analytical narrative.

"**T**est" stands for thinking through your analytical displays and thoroughly testing the relationships of the parts of the display. "**T**est" also stands for having a study partner work with you while you reconstruct your own previously developed analytical display. You will, of course, be using your memory and your ability to analyze to reconstruct what you know. With SMART you can study textbook chapters and other materials while simultaneously developing your analytical skills in thinking, reading, writing, listening, and speaking.

3. The SMART procedure prompts you initially to analyze main topic headings and the first sentences under each main topic heading.
4. Because you read and analyze only main headings and their associated sentences, the analysis is called a first-order analysis.
5. Nothing prevents you from analyzing the first *two* sentences, or even the whole paragraph under each main topic headings. If fact, with some textbook chapters, you may have to analyze additional text material in order to complete a first-order analytical display.
6. Nothing prevents you from analyzing the sub-headings associated with each main heading. If fact, with some textbook chapters, you may have to analyze additional headings in order to complete a first-order analytical display.
7. Your handwritten analytical display (like the one on page 103) represents a first-order analysis. This means that it deals with the major ideas in the chapter. Understanding the main ideas in a textbook chapter is your primary learning task. The remainder of the chapter can be learned by engaging in *pathway* analysis. (Analytical pathways are discussed below in chapter 7.)
8. SMART can be used to study any chapter in any textbook.

THE TIME WARP OF SMART

In this chapter, you have analyzed a sample textbook chapter on computers. The actual chapter contains over 12,000 words.

On page 95, you read and began to analyze only 196 of the 12,000 words in the sample chapter. This represents less than 2% of the words in the chapter. Despite using less than 2% of the words in the chapter, you were able to construct an *analytical and*

integrated view of the main ideas in the chapter. If you already know this much by using only 2% of the information, just think how smart you'll be when you use the other 98%!

Now that you are familiar with the SMART procedure, suppose that you already felt comfortable with it, as well. You know how to use it; you know how to identify purposes, resources, activities, and consequences; you know that you will end up with an analytical display and narrative. Suppose that you are already good at Whole Learning analysis of textbook chapters. Now suppose that you were asked to analyze the sample chapter on computers, never having seen it before. How long do you think it would take you to prepare the analytical display?

Would it take five minutes to prepare the analytical display? Ten minutes? Fifteen minutes? Let's say twenty minutes, which is quite generous for reading and analyzing nine headings and 196 words. At the end of twenty minutes, you have an analytical understanding of the main ideas in the chapter. You have been actively engaged with the subject matter. You have been making inquiries and discovering relationships. You have been learning the subject matter and analyzing it at the same time.

Now compare your lightning-like analytical effort with that of another student. That student uses the same twenty minutes and reads one word after another, one page after another, trying to memorize information, whether it's understood or not. Reading topics in this manner induces rote learning. It forces one to memorize the material as presented in the textbook chapter. Analytical connections among the topics and words are not made. What has that student accomplished after twenty minutes? What has that student learned after twenty minutes?

If that student is typical, he or she has probably read about 1,500 words during that twenty minutes. This is a mere three pages, a scant 12.5%, into the chapter. That student has most likely learned very little about computers, may be bored with reading, may have already stopped reading, and definitely is not SMART. Students who have not furthered the development of their analytical thinking, reading, and writing abilities have little to show for their time and effort.

How would you rather spend the twenty minutes? Would you rather be bored (perhaps to sleep) or engaged analytically? Do you want to deal with the stress of feeling that you have learned little or nothing? Do you want to feel that you are not prepared for the next class or for the next exam? Do you want to read each chapter in every one of your textbooks for every one of your courses in the same unrewarding way for the rest of your school, college, and life-long learning experiences? Wouldn't you prefer actually to learn something in those twenty minutes? Don't you desire to use your innate ability to think analytically? Don't you want to think for yourself and take responsibility for your own learning?

Use SMART well, and you use it to your learning and living advantage.

Chapter 7

How to Develop Analytical Pathways

ANALYTICAL PATHWAYS

In chapter 6, you developed a first-order analytical display of a chapter on computers. A first-order analytical display takes the major ideas in a chapter and arranges them in accord with a Whole Learning analytical display. You may often wish, however, to delve deeper into subject matter, to follow an analytical pathway of ideas or topics.

To develop an analytical pathway, you first develop a first-order analytical display. You then select a topic from the first-order display and develop an analytical display for it. You now have two displays, the first-order display and a second display based on a topic selected from the first-order display. When you use a topic in an existing analytical display to develop another, separate analytical display, you have started what is called an analytical pathway. You can continue along that analytical pathway, developing more and more displays within displays as you have topics and curiosity to pursue them.

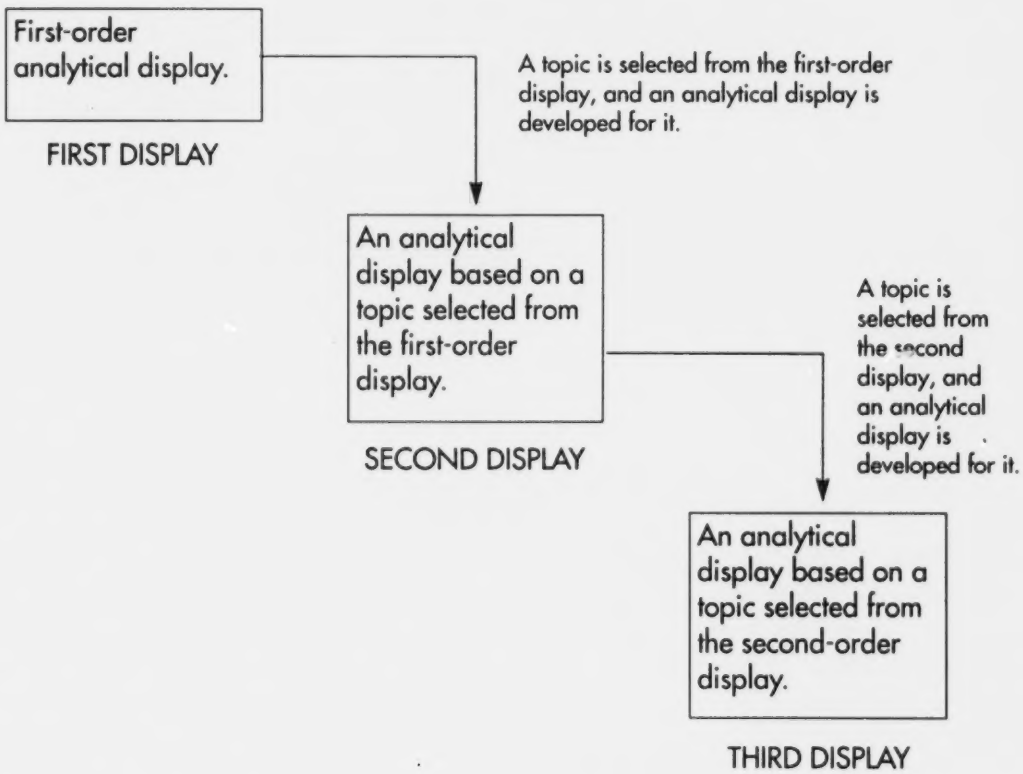
When should you develop an analytical pathway? Analytical pathways are determined by your need or desire to develop a more detailed understanding of subject matter. Pathways allow you to pursue all aspects of an area of interest. In this manner, you develop a thorough and critical understanding of the topic at hand.

Wonderful things can happen to you when traveling along analytical pathways. The book chapter or material that sparked the initial pathway may not contain enough information on a topic. To continue the path, you may have to use another book, and perhaps still another. You may have to talk to people, ask questions, seek other sources. These are the sorts of activities and experiences that help develop the cognitive skills of understanding, analysis, evaluation, and problem-solving. These are the skills you will use in school, in college, in the workplace, and in life.

Which topics will you want to select, and how far ought you travel a pathway? The answer lies in considering these questions: How important is the topic to you? How much interest does the topic hold for you? How intellectually uncomfortable will you feel unless you really achieve a comprehensive understanding of the topic?

Pathways are called "nested analyses" because one analytical display sits in, and grows out of, another. Here is an illustration that shows how a nested analysis proceeds.

Nested Analytical Displays


First-order analytical display.
FIRST DISPLAY
A topic is selected from the first-order display, and an analytical display is developed for it.
An analytical display based on a topic selected from the first-order display.
SECOND DISPLAY
A topic is selected from the second display, and an analytical display is developed for it.
An analytical display based on a topic selected from the second-order display.
THIRD DISPLAY

DEVELOPING AN ANALYTICAL PATHWAY

ANALYSIS 7-1: To Start the Pathway, Develop a First-Order Analytical Display

In this analysis, we develop a first-order display for chapter 5 in this book. Ordinarily, for a first-order analysis you would use only the first sentences that follow each main heading. First-order analysis is, however, a flexible idea. Depending on the chapter you use, you might want to take more raw material to analyze; this is what we will do with chapter 5.

Besides the title of chapter 5, that chapter contains only three major headings. Therefore, we shall use the first two sentences that follow each heading. For the "Conclusion" heading, we will take the first two sentences for each of the main ideas that the conclusion addresses. Here, then, is the raw material:

Techniques that Support Reading and Studying (chapter title)

Reading

You read books, newspapers, and magazines to enjoy yourself and to find specific information. Reading for enjoyment provides aesthetic pleasure, can be intellectually stimulating, and is a good use of time.

Studying

You study class notes, textbooks, and other materials so that you may understand and apply subject matter. When you study, you make a special effort to attach meaning to what you read and to develop application skills in the subject matter.

Conclusion

Reading: Reading newspapers and magazine articles is general reading. When reading for enjoyment or for information, you engage in general reading.

Studying: Merely reading words will not produce analytical learning. You need to reconstruct the material using an analytical framework.

Here is an analytical display for the preceding raw material:

Analyst: _____ Date: _____

Source of Raw Subject Matter: V. Maiorana, The Analytical Student. Bloomington, Indiana: ERIC/REC, 1994, chapter 5 — "General Ideas on Reading and Studying," pp. 79, 84, 91.

Title: An Analytical Display of Reading and Studying

(1) **Purpose** (Why?)
- to enjoy yourself
- to find specific information
- to understand and apply subject matter

(2) **Resources** (What is needed?)
- yourself
- books
- newspapers
- magazines
- information
- words
- ideas
- class notes
- analytical framework

(3) **Activities** (What is done?)
- Reading
  - general reading
- Studying
  - make special effort to attach meaning to what is read
  - develop application skills in subject matter
  - reconstruct material analytically

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

Reading: reading brings enjoyment and pleasure, can be stimulating, and is a good use of time

Studying: prepare yourself for the workplace, and develop a lifelong ability to think, read, and write analytically

Negative:

Reading: takes time; can be misleading, if what you read is prejudiced or not fair-minded

Studying: general reading or memorizing words and ideas is not analytical learning, requires time, possible stress, possible eye strain

Note: Some of the consequences shown above are not in the raw material, but that did not prevent us from thinking about them and adding them to the display.

ANALYSIS 7-2: Continue the Analytical Pathway

"Studying" is the second major activity shown under activities in the preceding analytical display. Let's suppose we wanted to know more about the activity of studying. Using the material from chapter 5, we can now make a display just on the topic of studying. We will use all of the headings, and the first two sentences that appear under "STUDYING" in chapter 5, above, pp. 84-90.

Here is the raw material taken from chapter 5:

STUDYING

You study class notes, textbooks, and other materials so that you may understand and apply subject matter. When you study, you make a special effort to attach meaning to what you read and to develop application skills in the subject matter.

Do You Know the Difference Between Memorizing and Understanding?

Memorizing: You memorize so you can recall information. Memorizing is accomplished through repetition.

Understanding and Learning: You study to understand and apply — to learn. You learn through analysis, application, and evaluation.

Locate Topic Headings

A topic heading often provides a link to the purpose of the paragraph that follows the topic heading. A topic heading in a textbook chapter is like a newspaper headline.

Locate Topic Sentences

A topic sentence expresses the main idea of a single paragraph. Stated another way, a topic sentence is the sentence that states the purpose of the paragraph.

Use the above raw material to develop an analytical display for studying. The display you develop represents a display along an analytical pathway. If you wanted, you could develop analytical displays further along the pathway on "memorizing," "understanding and learning," "topic headings," and "topic sentences."

QUESTIONS

1. What is a "first-order" analytical display?

_____

_____

2. What is an analytical pathway?

_____

_____

3. How far should you extend an analytical pathway?

4. Why are analytical pathways also called nested analyses?

5. In Analysis 7-2, you continued an analytical pathway by developing a display on the topic of studying. In this display, you probably identified "topic sentence" as a resource and "locate topic sentences" as an activity. Continue the pathway by developing an analytical display on topic sentences. For your raw material, use the first two paragraphs under "Locate Topic Sentences" on page 88.

Part 3

How to Learn Analytically across the Curriculum

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Chapter 8

Whole Learning in the Humanities

ANALYTICAL LEARNING IN THE HUMANITIES AND THE SOCIAL SCIENCES

The purpose of the humanities is to study and understand those endeavors that seem to define us as human. The humanities include art and music, religion and myth, politics and warfare, history and literature, and philosophy and ethics. Birds sing, and so do whales — with a greater vocal range than the human. Elephants grieve over their dead. Ants and bees are organized politically. Apes can communicate with us via sign language. Cats seem quite philosophical, though not particularly ethical. Now consider Tschaikovsky's "1812 Overture." The Overture is a celebration of the Russian defeat of Napoleon at the battle of Moscow. In writing this musical piece, Tschaikovsky included orchestra and chorus, church bells and cannons, and the Russian national hymn: "God, Ever Glorious." No animal, from ant to whale, ever composed anything so complex, and none ever will. To be human means to be complex.

The humanities are different from the natural sciences (math, physics, chemistry, biology, and geology) and technology (electrical, mechanical). The humanities are more subjective and less objective. By contrast, the sciences and technology are more precise, more predictable, and more measurable. You can predict scientific outcomes with precision — this chemical reaction, that biological growth, the other radiation effect — but you cannot predict humanistic outcomes precisely and individually. A poem, for example, is conditioned by the poet's unique historical experiences and individual education. Poetic inspiration is aimed at personal ends and unique goals that others may not share.

Other disciplines — such as psychology and sociology — are attempts at bridging the gap between the humanities and the sciences and technology. These two so-called "social sciences" are the organized study of human brains and psyches and states of consciousness. The purpose of psychology is to discern both individual and common

patterns of individual human reaction, response, and behavior. The purpose of sociology is to study group behaviors, the influence of society on itself and on individuals, and the patterns of human social interaction.

Just because the humanities are "fuzzy" and the social sciences are "soft" does not mean, however, that we cannot approach them, understand them, and learn them analytically. In fact, a Whole Learning analysis of the humanities and social sciences is exactly what is needed to keep them from being too fuzzy to be intelligible. Whole Learning keeps them from being so soft that they become intellectually mushy.

How then, do you study the humanities and social sciences analytically? Start by being thoroughly analytical. How can you be thoroughly analytical? You begin by asking the primary analytical question, the question of purpose. Human and social purposes are more complex, as well as more fuzzy, than scientific and technical ones. They are, therefore, more difficult to analyze. Nevertheless, by being consistent Whole Learning analysts of purpose, we can organize even the most complex human and social purposes into an intelligible analytical framework.

With Whole Learning, you identify another person's purpose in writing. That other person may be the author of your textbook, or the author of a novel or some great work. It can be your teacher, a newscaster or senator, your fellow student or friend, a supervisor, or co-worker. With Whole Learning, you understand the arguments being made that flow from the purpose. You determine whether the resources and activities put forth are consistent with, and will result in, the achieving of the purpose. You explore the consequences of the stated purpose. In doing so, you reveal whether the path chosen holds acceptable or unacceptable, foreseen or unforeseen outcomes. As a Whole Learner, you can critically understand the elements that constitute the arguments being made and the ideas being offered. You provide yourself with the crucial basis for further thought, discussion, and investigation.

"Fuzzy" or "soft" does not mean that some idea doesn't hold together. It merely means that the idea cannot be reduced to geometric logic supported by formula-based mathematical calculations. Whole Learning allows you to see just how well some "fuzzy" or "soft" idea holds together intellectually. Is the idea based on supportable analytical wholeness, or is it merely soft thinking and poor reasoning? Is the idea, concept, theory, or interpretation presented in a biased, prejudiced, unsupported, or unfair manner? These are the types of questions that are crucial to the study of the humanities and social sciences. These are exactly the types of questions that Whole Learning helps you pose and then answer.

Because the humanities address human thought and culture, humanists seek reasoned explanations to understand the human condition. When writing, students of the humanities seek to inform or persuade according to their view of the topic under discussion. When writing informatively, they will describe what someone else has written,

or explain the key ideas associated with others' points of view. When writing persuasively, they will attempt to present you with the merits of an idea.

Whole Learning strategy helps you determine whether informative or persuasive writing will stand up analytically. You become a sort of intellectual detective. You seek to find whether a written passage can survive the scrutiny of your analytical thinking. You learn the subject matter you are reading about. You also determine whether the written material is complete and fair-minded. For example, what purpose does some informative essay serve? Is the purpose supported through appropriate means? Are the conclusions (consequences) justified? On what purpose is some persuasive argument based? Are resources (including alleged facts) identified? Are activities (actions) described? Are consequences considered? Whole Learning strategy helps you to answer these questions.

In this chapter, we engage the humanities analytically, using topics in history, language, and art. Sample textbook and other material will be presented for you to analyze. You will use the analytical reading procedure shown in Table 6-1 on p. 94, above. In the next chapter, we follow a similar procedure with the social sciences.

HISTORY

ANALYSIS 8-1: Analyze the *First Amendment* to the *Constitution of the United States*

Here is the *First Amendment*. Read the amendment, then define the words listed below.

The First Amendment

> Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

Use a dictionary, if necessary, to help define unfamiliar words.

1. respecting: _____
2. establishment: _____
3. abridging: _____
4. thereof: _____
5. redress: _____

ANALYSIS 8-2: Develop an Analytical Display for the *First Amendment*

Develop an analytical display for the *First Amendment* (See Analysis 8-1 for the text associated with the *First Amendment.*) Associate your consequences with the display's statement of purpose. Be sure to identify both positive and negative consequences.

Analyst: _____ *Date:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of _____

(1) **Purpose** (Why?)

(2) **Resources** (What is needed?)

(3) **Activities** (What is done?)

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

Negative:

ANALYSIS 8-3: Identify the Five Freedoms

Based on your analytical display, list the five freedoms that Congress is specifically forbidden to abridge.

_____

_____

_____

_____

_____

ANALYSIS 8-4: Write an Analytical Narrative on the *First Amendment*

Write an analytical narrative based on the analytical display you developed in Analysis 8-2.

ANALYTICAL NARRATIVE

Topic: _____

Written by _____

ANALYSIS 8-5: Extend Your Knowledge of Freedom of Expression

In Analyses 8-1 through 8-4, you established an analytical understanding of the First Amendment. In this analysis, you will extend your understanding and address the freedom of artistic expression.

1. As it happens, the *First Amendment* to the *Constitution of the United States* does not specifically address the freedom of artistic expression. For example, drawings, photographs, and paintings are not mentioned in the *First Amendment*. Choose one of the five freedoms in the *First Amendment* that may be used by the courts as a basis for decisions concerning freedom of artistic expression. Write your answer here:

   _____

2. Develop an analytical display for the freedom you chose. The statement of purpose for this display might be "to prohibit laws that restrict artistic expression."

Analyst: _____ *Date:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of _____

(1) **Purpose** (Why?)

(2) **Resources** (What is needed?)

(3) **Activities** (What is done?)

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

Negative:

ANALYSIS 8-6: Write an Analytical Narrative on Freedom of Expression

Write an analytical narrative based on the analytical display you developed in Analysis 8-5.

ANALYTICAL NARRATIVE

Topic: _____

Written by _____

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ANALYSIS 8-7: Analyze the *Bill of Rights*

Develop an analytical display for an article from the *Bill of Rights*. Do not select the First Amendment. Write a narrative for the display you develop.

ANALYSIS 8-8: Analyze the U.S. *Declaration of Independence*

Develop an analytical display for the U.S. Declaration of Independence.

ANALYSIS 8-9: Analyze Lincoln's *Gettysburg Address*

Here is the text for President Abraham Lincoln's *Gettysburg Address* (Reference: *Harvard Classics,* v. 43, P. 415, 1910). Develop an analytical display and then write an analytical narrative based on the display.

Lincoln's *Gettysburg Address*

Fourscore and seven years ago our fathers brought forth on this continent a new nation, conceived in liberty, and dedicated to the proposition that all men are created equal. Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field as a final resting-place for those who here gave their lives that the nation might live. It is altogether fitting and proper that we should do this. But, in a larger sense, we cannot dedicate — we cannot consecrate — we cannot hallow — this ground. The brave men, living and dead, who struggled here have consecrated it, far above our poor power to add or detract. The world will little note, nor long remember, what we say here, but it can never forget what they did here. It is for us the living, rather, to be dedicated

here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us — that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion — that we here highly resolve that these dead shall not have died in vain — that this nation, under God, shall have a new birth of freedom and that government of the people, by the people, for the people, shall not perish from the earth.

ANALYSIS 8-10: Analyze a Speech by Another Historical Figure

Develop an analytical display for a speech given by an historical figure, for example, one of the American presidents, a U.S. civil rights leader, or an international figure.

LANGUAGE

ANALYSIS 8-11: An Analytical Display in Another Language

In this analysis, you have the opportunity to think analytically in another language. You will also learn something about the structure of language. That is, you will see that, regardless of the language used, resources will be associated with noun forms (persons, places, or things), and activities will be associated with verb forms (existence, action, or occurrence).

a. If you are studying another language, such as French, German, Italian, Russian, or Spanish, translate the analytical display you developed in Analysis 8-9 into that language.

b. Write an analytical narrative based on this display. Write the narrative in the same language used in the display.

c. Discuss your display and narrative with your language teacher. With your teacher as your guide, decide whether you have done a reasonably good job of thinking and writing analytically in your target language.

ART

ANALYSIS 8-12: Develop an Analytical Display on the Visual Arts

Below are entries taken from an analytical display on the visual arts. The entries are presented in list form. The list has been scrambled. Unscramble this list and develop an analytical display.

- By expressing oneself, one may offend another person. Expression of oneself may make a person feel vulnerable.
- imagination
- painting
- paint
- sculpting
- clay
- Satisfaction in making something original. Ability and confidence to express oneself in conventional and unconventional ways.
- cutting, pasting, welding
- kilns
- fashion design
- An Analytical Display of Visual Arts
- metal
- to express oneself
- making ceramics
- scissors
- cloth
- museums

ANALYSIS 8-13: Write an Analytical Narrative on the Visual Arts

Prepare an analytical narrative for the analytical display you developed in Analysis 8-12.

ANALYTICAL NARRATIVE

Topic: _____

Written by _____

ANALYSIS 8-14: Develop an Analytical Display for Analyzing a Play

Develop an analytical display for the following narrative. Give a title to your display.

> The purpose of analyzing a play is to understand how a play can entertain and inform. The resources required are a play, an analyst, and time.
>
> The activities associated with analyzing a play are, first, to identify the genre as a comedy or a tragedy; second, to characterize the players as antagonist or protagonist; and third, to plot the dramatic triangle: establish the setting, identify the rising action, develop the conflict, reach the climax, identify the falling action, and resolve the play (denouement).
>
> The positive consequences of analyzing a play are an appreciation of the play itself, how plays are constructed, and of the playwright's skills. The negative consequences of not analyzing a play are little understanding of the play itself, of how a play is constructed, and the skills required of a playwright.

QUESTIONS

1. Read the following editorial looking for evidence of purpose, resources (including facts), activities, and consequences. (a) Assemble your findings into an analytical display. (b) Based on the contents of the display, compose a title for the editorial and use this in the title of your display.

   In the long evolution of the human race up from the primeval ooze, no more significant step has ever been taken than yesterday's when man the worldling truly became but "little lower than the angels" and first set foot upon another planet. For thousands and thousands of years — all through the brief span of recorded history and through the dim ages of the darkening past — that puny creature endowed with the most powerful of all weapons, the human brain, has raised his eyes, his arms, his aspirations — first to the hills and mountain tops, then to the skies and the stars.

   And now he has attained the unattainable; he has lifted himself from this little speck of matter to walk the surface and probe the depths of another world. True, it is an even tinier world than the one we know, presumably a lifeless world, a forbidding world — but another world.

   This is the year, this is the month, the week, the day when, so far as we can know, for the first time in all the eons of existence of this universe of ours, a sentient being has transported himself from his earthly habitat to a different sphere floating in the endless sea of space. The men that landed yesterday on the moon represented not any group or creed or nationality; they represented all humanity and they carried with them a little bit of all the hopes and struggles of mankind to attain the heights throughout the ages.

   Yesterday, July 20, 1969, will be marked forever as the day man transcended the bonds of his nature and his environment, and the human race entered a new era leading to realms beyond comprehension and even imagination. Man has realized the unrealizable because he dared to conceive the inconceivable; now one can believe that the limitations to the accomplishment of man are set only by the limitations of the human spirit. (From *The New York Times*, July 21, 1969, p. 16)

2. Based on the display developed in answer to question 1, decide whether the editorial is: 1) fair-minded and 2) convincing.

Chapter 9

Whole Learning in the Social Sciences

The social sciences are concerned with how people behave, as individuals, in groups, and in society. Social scientists study human society because they want to know what people think, feel, and do — and why. The social sciences are generally considered to include anthropology, education, economics, history, political science, sociology, and psychology.

In this chapter, you will apply Whole Learning to the analysis of subject matter in the social sciences. Sample textbook and other material will be presented for you to analyze. Your purpose in this chapter is to build skill in analytical reading. You will use the analytical reading procedure shown in Table 6-1 on p. 94. You will find that the more you use Whole Learning strategy, the more confidence you will gain in your ability to tackle and understand any subject.

You will also find that you will begin to rely on and use Whole Learning in your general thinking, reading, writing, listening, and speaking. When this happens, you will begin to see the thoughtful person who already resides within you. You will begin to see the analytical and fair-minded you. The analyses in this chapter concern a variety of social science subjects: sociology, psychology, education, and economics.

SOCIOLOGY

ANALYSIS 9-1: Analyze Subject Matter in Sociology

Shown below are the main topic headings and the corresponding first sentences from the text by J. M. Shepard, *Sociology* (St. Paul: West Publishing Company, 1981, chapter 8, "Social Stratification, " pp. 177-206).

Prepare an analytical display for the following raw material. Use the analytical reading procedure shown in Table 6-1 on pages 69-70, above. For your display, you may photocopy the display template at the end of this book (or sketch your own).

SOCIAL STRATIFICATION (chapter title)

Status Seeking

Some of the most puzzling lifestyles on exhibit in the museum of world ethnography bear the imprint of a strange craving known as the "drive for prestige."

Dimensions of Stratification

Karl Marx and Max Weber are the two sociologists who have made the most significant contributions to the study of social stratification.

Explanations of Inequality — Two Theories of Stratification

Inequality — in wealth, power, and prestige — seems to be a basic fact of life in most societies.

Social Classes in America

Americans have always been aware of inequality, but they have never developed a sharp sense of class consciousness — a sense of identification with the goals and interests of the members of one's social class.

Social Mobility

Social mobility refers to the movement of individuals or groups within a stratification structure.

Consequences of Stratification — Social Class, Attitudes, and Behavior

Sociological research has demonstrated the association of distinct ways of thinking, feeling, and behavior with social class level.

ANALYSIS 9-2: Write a Social Science Narrative

Write a narrative for the analytical display you developed in Analysis 9-1. For your narrative, you may photocopy the narrative template at the end of this book, or you can write your narrative in your notebook.

ANALYSIS 9-3: Analyze Subject Matter in Sociology

Select a sociology textbook. Use the analytical reading procedure shown in Table 6-1 on p. 94 and prepare an analytical display for the chapter.

ANALYSIS 9-4: Write a Social Science Narrative

Write a narrative for the analytical display you developed in Analysis 9-3.

PSYCHOLOGY

ANALYSIS 9-5: Analyze Subject Matter in Psychology

Shown below are the main topic headings and the corresponding first sentences from Charles G. Morris, *Psychology: An Introduction* (Englewood Cliffs, N. J.: Prentice-Hall, Inc., chapter 13, "Stress and Adjustment," 1990).

Use the analytical reading procedure shown in Table 6-1 on p. 94 and prepare an analytical display for the following material:

STRESS AND ADJUSTMENT (chapter title)

Sources of Stress (the first topic heading)

Stress refers to any adjustive demand that creates a state of tension or threat and that requires change or adaptation.

How People Cope with Stress

Whatever its sources, stress calls for adjustment.

What Stress Does to People

In 1976, Canadian physiologist Hans Selye proposed that we react to physical and psychological stress in ways that he called the General Adaption Syndrome (or GAS for short).

Sources of Extreme Stress

Outside the laboratory, stress comes from a variety of sources, ranging from unemployment to wartime combat, from violent natural disaster to rape.

The Well-adjusted Person

Psychologists hold different opinions about what constitutes good adjustment.

Summary

Adjustment refers to any attempt to adapt to your physical and social environment and to achieve harmony between your desires and the demands and constraints imposed on you by the environment.

ANALYSIS 9-6 : Write a Psychology Narrative

Write a narrative for the analytical display you developed in Analysis 9-5.

ANALYSIS 9-7: Analyze Subject Matter in Psychology

Select a chapter in a psychology textbook. Use the analytical reading procedure shown in Table 6-1 on p. 94 and prepare an analytical display for the chapter.

ANALYSIS 9-8 : Write a Psychology Narrative

Write a narrative for the analytical display you developed in Analysis 9-7.

EDUCATION

ANALYSIS 9-9: Analyze Subject Matter in Education

Shown on the next page are the main topic headings and the corresponding first sentences from V. P. Maiorana, *Critical Thinking across the Curriculum: Building the Analytical Classroom* (Bloomington: ERIC/RCS at Indiana University, 1992, chapter 4, "Attributes of an Effective Methodology for Teaching Critical Thinking," pp. 35-49).

Use the analytical reading procedure shown in Table 6-1 on p. 94 and prepare an analytical display for the chapter.

ATTRIBUTES OF AN EFFECTIVE METHODOLOGY FOR TEACHING CRITICAL THINKING (chapter title)

Criteria for an Ideal Teaching Method
If current teaching methods are ineffective in promoting critical skills, why not design a new approach to teaching?

Simultaneity
Teaching course content and [critical thinking] at the same time allows traditional subject matter to be taught in a manner that promotes critical-thinking skills.

Focus
Making the subject matter itself, rather than the teacher and pedagogical purposes, the focus of the classroom effort, directs the students' attention to where it belongs, to the content of the subject matter.

Involvement
Requiring the active participation of students causes them to engage the subject matter directly, and it places responsibility for learning where it ultimately belongs—on the students themselves.

Multidisciplinary
The ability of all teachers to apply the method in all disciplines allows teachers across the curriculum to teach critical-thinking skills.

All Levels
Applicability of the method both in introductory courses and at advanced learning levels allows all students at all levels to develop thinking skills the first time they are introduced to a new subject-matter field.

Transferability
The ability to use the thinking skills learned inside of the classroom outside of the classroom makes the goals of lifelong learning and workplace competency a reality.

Assessability
A thoughtful and shared instrument by which to measure progress provides both the teacher and student with the ability to evaluate mutually what has been learned.

A Review of Existing Methodologies
Three classroom teaching methodologies are now in use: the lecture, Socratic questioning, and systematic problem-solving.

The Lecture
Although, according to a study conducted by the National Center for Research to Improve Post-secondary Teaching and Learning, "faculty overwhelmingly believe that the purpose of education is to think effectively," the lecture method is the road followed by most classroom teachers in the delivery of subject matter, and the ruts are deep.

Socratic Questioning
The asking of questions in an attempt to probe the validity of an argument, viewpoint, or proposition is generally attributed to Socrates.

Systematic Problem-Solving
The procedural steps involved in the modern problem-solving process stem from the reflective-thought constructs of John Dewey.

Existing Methodologies and an Ideal Method: A Comparison
Based on the criteria for an ideal method of critical thinking, I present in the following table a comparison of existing methodologies.

A New Method for Thinking across the Curriculum
The table shows that all three existing methodologies fall short of meeting the criteria.

ANALYSIS 9-10: Write an Education Narrative

Write a narrative for the analytical display you developed in Analysis 9-9.

ANALYSIS 9-11: Analyze Subject Matter in Education

Select a chapter in an education textbook. Use the analytical reading procedure shown in Table 6-1 on p. 94 and prepare an analytical display for the chapter.

ANALYSIS 9-12: Write an Education Narrative

Write a narrative for the analytical display you developed in Analysis 9-11.

ECONOMICS

ANALYSIS 9-13: Analyze Subject Matter in Economics

Prepare an analytical display for the following raw material:

The study of economics includes an analysis of supply and demand. The purpose of supply is to make goods and services available for purchase. The activities associated with supply are that individuals come up with ideas and combine resources, money is invested in the business, and goals are turned into directions for workers to follow.

The purpose of demand is to possess a good or service. For goods the product is made, a demand is generated, and the product is distributed to consumers. For services, the service is developed, a demand is generated, and the service is made available to customers. The activities associated with demand include deciding what is needed or wanted and purchasing the good or service.

The resources needed to achieve the purposes of supply and demand are owners, managers, workers, producers, goods and services, distributors, distribution channels, customers, and resources in the form of land, labor, and capital.

The consequences of making goods or services available for purchase (supply) or possessing a good or service (demand) are that businesses will sell goods and services for profit, combined resources will be used to utmost efficiency, workers will produce and sell goods and services efficiently, and consumers will choose goods and services to fulfill their needs and wants.

Negative consequences if the purpose is not fulfilled are that business will suffer losses instead of making profits, resources will be misused and combined ineffectively, workers will not produce and sell goods and services, and consumers will have fewer choices.

ANALYSIS 9-14: Analyze Subject Matter in Economics

Select a chapter in an economics textbook. Use the analytical reading procedure shown in Table 6-1 on p. 94 and prepare an analytical display for the chapter.

ANALYSIS 9-15 : Write an Economics Narrative

Write a narrative for the analytical display you developed in Analysis 9-14.

Chapter 10

Whole Learning in the Natural Sciences

ANALYTICAL LEARNING IN THE NATURAL SCIENCES

The social sciences and the humanities concern how people live, think, feel, communicate, and behave. The natural sciences (including math, physics, chemistry, biology, and geology), concern how the natural world works and behaves. This includes people, too, insofar as people also are part of nature. The hard goods and consequences of scientific research (automobiles, airplanes, spaceships, vaccines, the atom bomb, test-tube babies), however, also affect people's thinking and feeling, communication, and behavior. Your understanding of the world you live in requires, therefore, an appreciation of the basics of math and science. The study of math and science allows you to understand better, and perhaps to shape, present and future technological, environmental, and personal changes.

Mathematics includes the study of arithmetic, algebra, geometry, trigonometry, calculus, statistics, and business math. Science includes the study of physics, biology, and chemistry, and mixtures of all of these fields. How does Whole Learning help you to understand math and science? Math and science comprise many ideas, elements, formulations, and instruments. By revealing their purposes analytically, you will come to understand the theoretical as well as the practical aspects of math and science. You will also learn to use Whole Learning strategy as an analytical tool to help solve problems in math and science.

HOW TO APPROACH THE STUDY OF MATH AND SCIENCE

Keep these three ideas in mind when studying math and science:

1. Be precise in your problem-solving efforts.
2. Use Whole Learning to solve problems.
3. Do the assigned problems.

Be Precise in Your Problem-Solving Efforts

Mathematicians and scientists usually recognize only one correct (exact) answer. To be scientifically exact and mathematically accurate, you must be precise. In arithmetic, two plus two can only be four — no more and no less. Recognize that the natural sciences are built on accuracy. It will help you adopt a precise and orderly attitude toward your studies.

Adapt Whole Learning Strategy to Problem Solving

As applied to math and science, problem solving generally involves these steps: (1) define the problem, (2) gather facts, (3) solve the problem, and (4) evaluate the answer. Here is how you can relate Whole Learning to these four steps:

1. Defining the problem is similar to defining the purpose.
2. Gathering facts is similar to gathering resources.
3. Solving the problem is the same as engaging in those activities that lead to a problem solution.
4. Evaluating your answer is similar to analyzing for consequences, and it is thus the last activity associated with solving the problem. Does your answer make sense in light of the problem statement (purpose)?
5. Thinking through to consequences is something special that Whole Learning brings to the problem-solving procedure. At a minimum, consider what new knowledge has been gained as a consequence of solving a problem. Do this in the context of the problem itself, as well as the effect its solution can have on human thought, feelings, and behavior.

1. *Define the purpose of your problem-solving effort.* Many students get sidetracked in problem-solving because either they do not understand or they misinterpret the problem to be solved. Therefore, before proceeding with the problem, make sure that you understand it. It helps to describe in writing, whether with words or mathematical symbols, what you are being asked to solve. It also helps to phrase the problem as a statement of purpose. A great aid to problem definition and solution is to visualize or sketch a model of the problem in the form of an analytical display.

2. *Gather resources.* Assemble and organize all the information stated or implied in the problem statement.

3. *Engage in problem-solving activities.* Execute the required calculations and operations in a neat and orderly fashion. Through use of analytical displays, cultivate the ability to show clearly what you are doing. Another person should be able to pick up your solution design (your analytical display) and easily follow all of your steps.

4. *Evaluate your answer.* Evaluating your answer is also an activity. Does your answer make sense in light of the problem statement and the figures given? Suppose you

have been asked to determine the percentage of all your friends who weigh more than 200 lb. If your answer works out to be 125%, then you know that something is wrong with your answer. Why? All of your friends, on a percentage basis, cannot equal more than 100% of all of your friends. So even if all of your friends weighed more than 200 lb., the percent answer could not be more than 100%. If you have left a calculation trail that is easily retraced, then you will be able to locate your error and correct your answer.

5. *Consider the human consequences of your problem-solving effort.* For example, if your purpose was "to determine the percent of friends who weigh more than 200 lb.," then one result of achieving this purpose is that you have new knowledge concerning your friends. Perhaps this information could be useful in choosing sides for a team wrestling match; or, if the percentage seems high, perhaps a group diet is in order.

Do the Assigned Problems

Math and science courses require large amounts of participation, organization, and persistence. It's quite possible to sit in class and follow a teacher's solution to a problem, or to read and follow an illustration in a textbook. In these passive situations, however, you do not actually *do* the brainwork yourself. It is quite another matter to solve new problems on your own.

It's not enough to say, "I think I understand the material. I can do that! I could solve a problem if I had to, so I won't bother with the homework." You must involve yourself directly in solving the assigned problems. You must actually *work the problems* to assure yourself that you are in fact mastering the subject matter.

The following sections illustrate the application of Whole Learning to the study of mathematics and science.

WHOLE LEARNING AND PROBLEM SOLVING

To solve a problem requires some prior knowledge of the subject matter that the problem addresses. For example, if you were asked to solve a problem using "subscripted variables," you would first have to know what a subscripted variable is, what purpose it serves, and how one uses it to help solve a problem.

The following analysis of addition is an example of how to approach other topics in math and science. First, you will be introduced to math or science subject matter using Whole Learning. This introduction will serve to provide you with the prior knowledge necessary to solve a problem. Second, you will be provided with a specific illustration of how to solve a problem using the Whole Learning problem-solving strategy. Third, you will be asked to use Whole Learning problem-solving strategy to solve a new problem on your own. To illustrate these three steps, let's use a topic that you are already familiar with — addition.

Addition

The purpose of addition is to compute the sum (total) of groups of things that are represented as numerical quantities. The resources needed to do addition are two or more numbers, a need to add the numbers, and a mathematical system for adding numbers.

These are the activities required to add numbers by hand: (1) Write down the numbers in column form, one under the other, observing place values and decimals, if any. (2) Starting with the right-most column, add the values in that column. (3) If the value exceeds 10, carry the amount of excess, in units of ten, to the next column. (4) Repeat the procedure for any remaining columns. (5) Evaluate the answer.

If the purpose is achieved, a positive consequence of adding numbers is that a total quantity is now known. If the purpose is not achieved, a negative consequence is that the total quantity is not known. Depending upon the nature of the numbers being added (for example, sales dollars, patients in a hospital, customers in a restaurant), one might develop additional positive and negative consequences.

Here is a summary, in analytical display format, of the foregoing discussion:

Title: An Analytical Display of Addition

(1) Purpose (Why?)

- to add quantities of things

(2) **Resources** (What is needed?)

- two or more things to add
- a need to add the things
- a numerical system that allows quantities to be added (the base 10 system is such a system)

(3) **Activities** (What is done?)

1. Write down the numbers in column form, one under the other, observing place values and decimals, if any.
2. Starting with the right-most column, add the values in that column.
3. If the value exceeds 10, carry the amount of excess, in units of ten, to the next column.
4. Repeat the procedure for any remaining columns.
5. Evaluate the answer.

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive (if purpose is achieved): A total quantity is known.

Negative (if purpose is not achieved): A total quantity is not known.

Solving a Sample Addition Problem

The Problem Statement: Here is how you will be asked to solve problems in this and other chapters. You will be presented with a "problem statement." A problem statement has two parts: A: *Read and Understand the Problem Information,* and B: *Use an Analytical Display to Set Up a Solution to the Problem.* Here is an example of a problem statement:

Part A: Read and Understand the Problem Information

The Situation: Mrs. Brown visits a park. At the park, she sees six geese a-laying, seven swans a-swimming, and a partridge in a pear tree. She notices that feeding the animals is permitted, and so she makes a mental note to bring bird food with her the next time she visits the park.

The Problem: Find the total number of birds that Mrs. Brown saw at the park.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves the problem. Perform all of the activities called for in the "Activities" portion of the display. Make sure to evaluate your answer.

The next page shows how to use an analytical display to solve a math or science problem. Read through the display starting with its title. Notice that the purposeful statement focuses on the intent of solving the problem at hand. The resources allow one to gather all the data given in the problem. The activities provide a clear calculation trail. The consequences provide a basis for stating the new knowledge discovered as a consequence of solving the problem. In sum, the use of an analytical display helps you to adopt an orderly and precise approach to problem-solving.

Title: An Analytical Display of Adding Quantities of Birds

(1) Purpose (Why?)

- to find the total number of birds that Mrs. Brown saw at the park

(2) **Resources** (What is needed?)

- six geese
- seven swans
- one partridge
- a numerical system that allows quantities to be added (the base 10 system will be used)

(3) **Activities** (What is done?)

1. Write down the numbers in column form

$$\begin{array}{r} 6 \\ 7 \\ \underline{1} \end{array}$$

2. Add the numbers in the right-most column

$$\begin{array}{r} 6 \\ 7 \\ \underline{1} \\ 4 \end{array}$$

3. Carry the amount of excess, if any, to the next column

$$\begin{array}{r} {\scriptstyle 1}\ 6 \\ 7 \\ \underline{1} \\ 4 \end{array}$$

4. Repeat the procedure for any remaining columns

$$\begin{array}{r} {\scriptstyle 1}\ 6 \\ 7 \\ \underline{1} \\ 1\ 4 \end{array}$$

5. Evaluate the answer
   The answer should not be less than one and should be greater than seven. On this basis, an answer of fourteen seems reasonable.

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive (if purpose is achieved):

(1) Mrs. Brown now knows how many birds altogether she saw at the park.

(2) Mrs. Brown now has an idea of how much bird food to bring on her next visit to the park.

Negative (if purpose is not achieved):

(1) Mrs. Brown does not know how many birds she saw.

(2) Mrs. Brown may bring an inadequate amount of bird food the next time she visits the park.

Solving an Addition Problem on Your Own

Having been shown how to solve a problem, now it's time to solve one on your own.

Part A: Read and Understand the Problem Information

The Situation: Lauren, Joseph, Michael, and Richard go to the candy shop. Lauren buys seven bubble-gum balls, Joseph buys four strips of licorice, Michael buys six canes of peppermint, and Richard buys eight lollipops.

The Problem: Find the total number of pieces of candy purchased by Lauren, Joseph, Michael, and Richard.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves the problem. Perform all of the activities called for in the "Activities" portion of the display. Make sure to evaluate your answer, including the human consequences. (What will that much sugar do to their teeth?)

Applying Whole Learning to Problem-Solving

Well, there you have it. You have seen how Whole Learning problem-solving works. First, you learned about new subject matter. Then, you saw how to solve a typical problem. Last, you solved a new problem on your own and identified consequences.

Now lets see how well you can do, on your own, in applying Whole Learning to math and science topics.

MATHEMATICS

Arithmetic

ANALYSIS 10-1: Introduction to Decimals

Develop an analytical display and narrative for the items listed below. Note that all of the elements that comprise an analytical display are included in the list: *title, purpose, resources, activities,* and *consequences.* The "vocabulary box" explains new terms. Put the vocabulary box at the bottom of your analytical display.

- An Analytical Display of Decimals (this is the title of the display)
- understanding of the Base 10 system
- divide the denominator into the numerator (place the decimal, add zero, do the division)
- Values of less than one can be accounted for and used when making physical measurements and when accounting for money.
- evaluate the answer
- to allow values of less than one to be mathematically represented

- understanding of basic arithmetic operations
- evaluate the answer
- integers and decimals
- a problem to solve
- relate the numbers as a fraction

Vocabulary Box (explanation of new terms)

Numerator: When representing a value in fraction form, such as ¾, the number on top (3 in this case) is called the numerator.

Denominator: When representing a value in fraction form, such as ¾, the number on the bottom (4 in this case) is called the denominator.

ANALYSIS 10-2: Calculate a Decimal Value — An Illustration

Part A: Read and Understand the Problem Information

The Situation: Mrs. Brown bakes an apple pie and invites Lauren, Joseph, Michael, and Richard to a party. Mrs. Brown cuts the apple pie into eight pieces. When the party is over, two pieces of the apple pie remain uneaten. This means that six of eight pieces have been eaten. Stated as a fraction this number is written ⅝.

The Problem: Find out in decimal equivalents what portion of an apple pie has been consumed.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves or sets up a solution to the problem. Perform all of the activities called for in the activities portion of the display. Make sure to evaluate your answer.

Here is the analytical display showing the completion of all the activities. Read through the display, starting with its title. Pay particular attention to the activities.

Title: An Analytical Display of Calculating a Decimal Value

(1) Purpose (Why?)

- To find out in decimal equivalents what portion of an apple pie has been consumed

(2) **Resources** (What is needed?)

- an apple pie divided into eight slices
- knowledge that six of eight pieces have been eaten

(3) **Activities** (What is done?)

- represent the problem as ⅝
- divide the numerator (6) by the denominator (8) as follows:

$$8\overline{)6.}$$

- place the decimal

$$8\overline{)6.}$$

- add zero

$$8\overline{)6.0}$$

- do the division

$$\begin{array}{r} .75 \\ 8\overline{)6.0} \\ \underline{56} \\ 40 \\ \underline{40} \\ 00 \end{array}$$

- The decimal value is 0.75
- Evaluate
- Because ⅝ is less than one, its decimal equivalent should also be less than one. The decimal answer is 0.75, which is less than one. Therefore, the answer appears reasonable.

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: You can say that 0.75, or ¾, or 75% of the pie has been consumed.

Negative: May have consumed some unneeded calories; if more pie is wanted, Mrs. Brown, or someone, will have to spend more money.

Vocabulary Box (explanation of special terms)

Numerator: when representing a value in fraction form, such as ¾, the number on top (3 in this case) is called the numerator. It represents the number of fractional parts.

Denominator: when representing a value in fraction form such as ¾, the number on the bottom (4 in this case) is called the denominator. It represents the number of parts into which the whole has been divided.

ANALYSIS 10-3: Calculate a Decimal Value — A Problem

Part A: Read and Understand the Problem Information

The Situation: A company is taking an inventory of its stock of wooden tables. The inventory shows that five of the nine tables have been sold. Stated as a fraction this becomes $\frac{5}{9}$.

The Problem: Find the decimal equivalent of the fraction $\frac{5}{9}$.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves or sets up a solution to the problem. Perform all of the activities called for in the activities portion of the display. Make sure to evaluate your answer.

Algebra

ANALYSIS 10-4: Introduction to Solving for a Single Variable

Develop an analytical display based on the following narrative. At the end of the narrative are contents for a vocabulary box. Put this box at the bottom of your display.

> The purpose of solving for a single variable is to find the value of an unknown quantity. The resources needed are a symbol to represent the unknown quantity, a value that is known, and information about how the known value is related to the unknown quantity.
>
> When solving for a single variable, the following activities are engaged in: (1) set the unknown value equal to the selected symbol, (2) write an equation that relates the unknown value to the known value, (3) solve for the unknown value, and (4) evaluate the answer.
>
> If the purpose is achieved (if the unknown value is discovered), then positive consequences are that the now known value can be used to come to some conclusion, help make some decision, or be of use in solving some other problem. If the purpose is not achieved (if the unknown value is not discovered), then a negative consequence is that the value remains unknown; therefore, the unknown value cannot be used to come to some conclusion, help make some decision, or be of use in solving some other problem.
>
> Vocabulary Box:
>
> Variable: A variable is something that can vary or change. For example, the outside temperature changes from day to day, so outside temperature is a variable.
>
> Symbol: A symbol is a written sign used to represent something. For example, the symbol $, represents dollars.

ANALYSIS 10-5: Solve for a Single Variable — An Illustration

Part A: Read and Understand the Problem Information

The Situation: Mrs. Brown sees a newspaper ad for a video tape recorder. The ad says that the price of $150 is 20% less than the regular price.

The Problem: Find the regular price of the video tape recorder.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves or sets up a solution to the problem. Perform all of the activities called for in the activities portion of the display. Make sure to evaluate your answer.

Here is the analytical display showing the completion of all the activities. Read through the display, starting with its title. Pay particular attention to the activities.

Title: An Analytical Display of Calculating a Regular Price

(1) Purpose (Why?)

- To find the regular price of a video tape recorder

(2) **Resources** (What is needed?)

- Knowledge that Mrs. Brown paid $150 for a video tape recorder
- Knowledge that $150 is 20% less than the regular price
- The symbol "X" to represent the unknown value of the video tape recorder

(3) **Activities** (What is done?)

1. Set the unknown value equal to the selected symbol
   - let X = regular price of the tape recorder
2. Write an equation that relates the unknown value to the known value
   - 80% of X is = 150 (Note: If Mrs. Brown got a 20% discount off the regular price, then she paid 80% of the regular price)
   - Since 0.8 is the decimal equivalent of 80%, we rewrite the equation as 0.8 * X = 150
3. Solve for the unknown value
   0.8 * X = 150
   X = 150 / 0.8
   X = 187.50
4. Evaluate the answer
   The answer cannot be less than $150 since 150 represents the discounted value. Therefore, the answer must be greater than $150. Also, because the discount was only 20%, the unknown value must be fairly close to 150. Because 187.50 is greater than 150, and because it is fairly close to 150, 187.50 seems to be a reasonable answer.

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive (if purpose is achieved): Mrs. Brown can save $37.50 ($187.50 - $150) if she purchases the recorder.

Negative (if purpose not achieved): Mrs. Brown will not know the actual amount of dollars she can save if she purchases the discounted recorder.

ANALYSIS 10-6: Solve for a Single Variable — A Problem

Part A: Read and Understand the Problem Information

The Situation: Company 1 is buying eight machines costing a total of $54,000. Company 2 is buying four identical machines at a total cost of $20,000.

The Problem: Find the average cost of one machine.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves or sets up a solution to the problem. Perform all of the activities called for in the activities portion of the display. Make sure to evaluate your answer.

Here is a partial analytical display to help get you started.

Title: An Analytical Display of Finding the Cost of One Machine

(1) **Purpose** (Why?)

- to find the average cost of one machine

(2) **Resources** (What is needed?)

- Company 1 is paying $54,000 for 8 machines
- Company 2 is paying $20,000 for 4 machines
- the symbol "X" to represent the average cost of one machine

(3) **Activities** (What is done?)

1. Set the unknown value equal to the selected symbol.
   - Let X = the average cost of one machine
2. Write an equation that relates the unknown values to the known values.
   - 8 * X + 4 * X =
3. • 12 * X =
4. • X =
5. Evaluate answer

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

Negative:

ANALYSIS 10-7: Solve for a Single Variable — A Problem

Part A: Read and Understand the Problem Information

The Situation: The marketing department can hire 8 new secretaries, and the sales department can hire 13 new secretaries. The total budget for hiring new secretaries is $483,000.

The Problem: Find the average salary of a new secretary.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves or sets up a solution to the problem. Perform all of the activities called for in the activities portion of the display. Make sure to evaluate your answer.

SCIENCE

Force

ANALYSIS 10-8: Introduction to Force

Read the following material and develop an analytical display.

One purpose for which force can be used is to set a body in motion (to accelerate). A body is some physical object such as a table, chair, or pushcart. Force is a quantity that tends to set a body in motion, and the body will accelerate in the direction of the force. For example, if you use your arms to push a table across a room, the table will move (accelerate) in accord with how much force you apply and in the direction that you push it (apply the force).

The resources needed to set a body in motion are some physical body that can be set in motion, a means of applying force to the body, and a desired acceleration rate. The weight of the body is measured in pounds. Acceleration (a *change* of velocity) is measured in ft/sec^2.

The required quantity of force to move a body is obtained by multiplying the weight of the body in pounds by the desired acceleration in ft/sec^2. Stated as an equation Force = Weight or Mass multiplied by the rate of acceleration, or $F = M*A$.

When solving a problem in physics, such as calculating a desired force, it is helpful to follow these steps: (1) sketch out the problem, (2) apply the appropriate formula, in this case $F = M*A$, (3) evaluate your answer.

If the amount of force can be carefully controlled and directed, then a positive consequence of force is that a body can be moved in a desired direction at a desired rate of acceleration. If the amount of force cannot be carefully controlled and directed, then a negative consequence of force is that a body cannot be moved in a desired direction at a desired rate of acceleration.

Vocabulary Box (explanation of terms)

Velocity: a quantity whose size is a body's speed (measured in ft/sec), and whose direction is the body's direction of motion.

Acceleration: to set in motion; to speed up

ANALYSIS 10-9: Calculate Force — An Illustration

Part A: Read and Understand the Problem Information

The Situation: A 10 pound bowling ball is to be accelerated to 20 ft/sec^2.

The Problem: Find the required force.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves or sets up a solution to the problem. Perform all of the activities called for in the activities portion of the display. Make sure to evaluate your answer.

Based on the narrative material presented in Analysis 10-8, here is the analytical display that includes the activities to be performed to solve the problem. Read through the display starting with its title.

Title: An Analytical Display of Calculating Required Force

(1) Purpose (Why?)

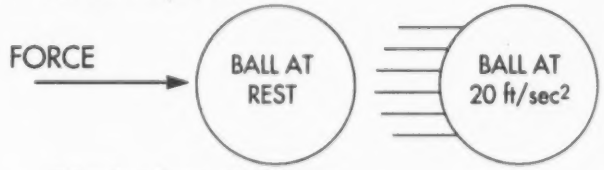
- To calculate the axial force required to accelerate a 10 pound ball to 20 ft/sec^2

(2) **Resources** (What is needed?)

- the formula:
  F = M * A
  Force = ft. lbs./sec^2
  Mass = lb.
  Acceleration = ft/sec^2
- a 10 lb. bowling ball at rest
- a desired acceleration of the of the ball to 20 ft/sec^2

(3) **Activities** (What is done?)

- Sketch the problem:



- Calculate force as follows:
  F = M * A
  F = [10 lb.] * [20 ft/sec^2]
  F = 200 ft. lbs./sec^2
- Evaluate the answer: Because multiplication is involved, the answer must be larger than either of the two values multiplied. Because 200 is greater than 10 or 20, the answer of 200 is at least in the right direction.

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive (if purpose is achieved): Knowledge of what force to apply. Bowling ball will move at desired acceleration if calculated force is applied.

Negative (if purpose not achieved): Will not know what force to apply. Ball will not move at desired acceleration.

ANALYSIS 10-10: Calculate Force — A Problem

Part A: Read and Understand the Problem Information

The Situation: A force of 400 ft. lbs./sec^2 is applied to a bowling ball. The ball accelerates to 25 ft/sec2

The Problem: Find the weight of the bowling ball.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves or sets up a solution to the problem. Perform all of the activities called for in the activities portion of the display. Make sure to evaluate your answer.

WHOLE LEARNING AND THE SCIENCE LAB

Whole Learning does not stop at the laboratory door. In this section, you will set up an analytical display solution to a lab assignment associated with measurement. First let's discuss measurement.

Measurement

ANALYSIS 10-11: Introduction to Measurement

GENERAL DISCUSSION

From a scientific point of view, the purpose of measurement is to observe and record data accurately. Because scientists accept that our senses do not always provide us with accurate observations, we use the tools of measurement. These tools allow us to make accurate observations only when they are used correctly.

The resources (tools) of measurement include metric rulers, triple beam balances, and graduated cylinders. Other resources include beakers, test tubes, blocks, coins, stoppers, paper, various liquids (water, glycerin, oil, and alcohol).

There are many activities associated with measuring solids, liquids, and gases. When dealing with a solid, its length, volume, and mass are measured and recorded. The density of the solid can then be calculated. When dealing with a liquid, its volume and mass are measured and recorded. The density of the liquid can then be calculated. When dealing with a gas, its volume and pressure are measured and recorded. The temperature of the gas can then be determined.

A positive consequence of measuring is that accurate recording of data during an experiment leads to valid conclusions, whereas inaccurate measurements do not. Other positive consequences are (1) the use of

appropriate units that adds to the accuracy and applicability of data, (2) identification of substances according to their densities — a result that may be applied to practical problems such as using the correct amount of antifreeze. If the purpose is not achieved, negative consequences include using the wrong amount of a substance, look-alike liquids may be incorrectly substituted, and inaccurate measurements may result in incorrect conclusions.

MEASURING LIQUIDS

One of the activities described in the discussion above is that of measuring liquids. Liquid quantities are often measured with a test tube. To insure accuracy, test tubes must be calibrated. Here is an analytical display that addresses measurement in the science lab with test tubes. The display addresses the calibration of a test tube.

Title: An Analytical Display of the Calibration of a Test Tube

(1) **Purpose** (Why?)

- to make sure you use the right size of test tube
- to mark a test tube at particular volumes

(2) **Resources** (What is needed?)

- water
- test tubes
- graduated cylinders
- beakers
- wax pencils

(3) **Activities** (What is done?)

Do the following to verify that the right size of test tube will be used by determining the test tube's volume

1. Fill a test tube with water.
2. Pour the water from a test tube into a graduated cylinder.
3. Measure and record the volume of water that the test tube held.
4. Mark the test tube.
5. Dispose of water.

Do the following to mark a test tube at a particular volume

1. Measure 5 ml of water.
2. Pour 5 ml of water into the test tube.
3. Mark the level of water on the test tube using a wax pencil.

Evaluate your lab results

1. Check to see whether you have calibrated all the test tubes called for in the experiment.
2. Make sure that your measurements have been written down clearly.
3. Recalibrate one of the test tubes to validate your results.

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive (if the purpose is achieved):

(1) The correct size of test tube will be used in an experiment.
(2) A test tube can be used to measure approximate liquid volumes.

Negative (if purpose is not achieved):

(1) The test tube may be too small or too large to hold the amount of liquid used in an experiment.
(2) A graduated cylinder will always be used to measure liquid, even small amounts.

Vocabulary Box (explanation of special terms)

Calibration: To determine the size of something by comparison with a standard. For example, you can measure how long a stick is by comparing it to a ruler (the standard). When you mark a length on the stick, you have calibrated the stick.

Graduated Cylinder: A liquid container that is marked at intervals. The markings show a quantity of liquid volume (that is, 1 ounces, 2 ounces, 3 ounces, or 5 ml, 10 ml, and so on)

Beaker: A container for liquids.

ANALYSIS 10-12: Calibrate Test Tubes — An Illustration

Part A: Read and Understand the Problem Information

The Situation: You are gathering materials for an experiment. Among the materials are five test tubes of unknown volume.

The Problem: Determine the volume of each of the test tubes

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves or sets up a solution to the problem. In the laboratory, perform all of the activities called for in the activities portion of the display. Make sure to evaluate your answer.

Here is how an analytical display is used to help conduct an experiment in a science lab. The analytical display addresses test-tube calibration; it is based on the display above. The statement of purpose focuses on the purpose of the lab experiment. The resources show all the equipment necessary to conduct the experiment. The activities show the steps necessary to conduct the experiment. The consequences provide a basis for stating the new knowledge discovered as a consequence of conducting the experiment. You can use an analytical display to organize and carry out all your science lab assignments. An analytical display helps you to adopt an orderly and precise approach to problem-solving in the science lab.

Read through the display, starting with its title. Although you are not now in a science laboratory, you can envision performing the activities.

Title: An Analytical Display of the Calibration of a Test Tube

(1) **Purpose** (Why?)

- to determine the volume (to calibrate) five test tubes

(2) **Resources** (What is needed?)

- water
- 5 test tubes
- graduated cylinders
- beakers
- wax pencils

(3) **Activities** (What is done?)

1. Select the first test tube.
2. Use a beaker to fill the test tube with water.
3. Pour the water from the test tube into the graduated cylinder.
4. Measure and record the volume of water that the test tube held.
5. Using a wax pencil, mark the test tube with its size.
6. Dispose of water.
7. Repeat steps 1 through 6 with the remaining test tubes.
8. Evaluate your lab results.

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive (if the purpose is achieved):

(1) The size of each test tube will be known.

(2) The test tubes can be used to measure and/or hold approximate liquid volumes for the experiment.

Negative (if purpose is not achieved):

(1) The size of each test tube will not be known.

(2) If the unmarked test tubes are used in the experiment, it could lead to incorrect measurements. Incorrect measurements can invalidate the results of an experiment.

ANALYSIS 10-13: Calibrate Test Tubes -- A Problem

Part A: Read and Understand the Problem Information

The Situation: You want to run an experiment that requires the use of 5 ml of three different liquids. You look around the lab and find three unmarked test tubes.

The Problem: Mark each test tube at the 5 ml volume.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves or sets up a solution to the problem. In the laboratory, perform all of the activities called for in the activities portion of the display. Make sure to evaluate your answer.

Develop an analytical display for use in the science lab. Make sure to use the appropriate sequence of activities shown in the analytical display on p. 159.

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Geology

ANALYSIS 10-14: Introduction to Geology

The entries in this analytical display have been scrambled: Resources appear as activities, purpose as consequences, and so on. Unscramble the display. Write a correct analytical narrative based on your unscrambled display. The material for the display is based on: C. W. Montgomery, *Physical Geology,* 2nd ed. (Wm. C. Brown Pub., 1987, chapter 1, pp. 3 to 18).

Analyst: _____ Date: _____

Source of Raw Subject Matter: _____

Title: Oceans

(1) Purpose (Why?)

- If we don't take care of the earth, it will die and so will humans.

(2) **Resource** (What is needed?)

- land
- human existence
- atmosphere
- water
- maintaining equilibrium
- the earth's solar system

(3) **Activity** (What is done?)

- air
- heating and differentiation
- geological processes
- planets
- birth and death of stars
- an Analytical Display of the Earth
- If we take care of the earth, then it will pay us back by giving us more resources, so we humans can live longer.

(4) **Result** (What can happen if purpose is/is not achieved?)

Positive: the effect of the passage of time

Negative: To provide humans with everyday needs and services (from the viewpoint of those who inhabitant the earth).

ANALYSIS 10-15: Introduction to Geology

Locate an "Introduction to Geology" textbook and develop an analytical display for its first chapter. Compare that display to the unscrambled display you developed in Analysis 10-14. Make a list of the similarities and differences between the two displays.

QUESTIONS

1. As applied to math and science, problem-solving generally involves these steps: (1) define the problem, (2) gather facts, (3) solve the problem, and (4) evaluate the answer. Whole Learning is an analytical strategy that helps you solve problems. Think about the analytical display as you answer these questions.
   a. What is defining the problem similar to?
   b. What is gathering facts similar to?
   c. What is solving the problem the same as?
   d. Evaluating your answer is associated with which part of an analytical display?
   e. What does identifying consequences allow you to consider?
2. When used to solve a math or science paper-and-pencil problem, the title, purpose, resources, activities, and consequences in an analytical display all serve special functions. What are they?
3. When used to conduct a science lab experiment, the title, purpose, resources, activities, and consequences in an analytical display all serve special functions. What are they?

Chapter 11

Whole Learning in the Technologies

ELECTRICAL TECHNOLOGY

The purpose of electrical technology is to control electricity in the service of human beings. The positive consequences (results) of controlling electricity include medical equipment such as x-ray machines and magnetic resonating devices (MRI), home appliances, lighting and labor-saving devices, and the facilitation of basic research in many fields of science.

The resources needed to control electricity include a source of electrical power and an application (called a "load") that requires electricity. Typical loads are an electrical hoisting device, an automobile ignition system, or a television set. Also needed are electrical components: resistors, capacitors, wires, and measuring devices such as ammeters, ohmmeters, and oscillators.

Electricity is controlled through an electrical circuit. An electrical circuit is composed of a voltage source, a load, and wires that connect the two and allow current to flow through the circuit. For example, a home television set is connected by house wire to a control panel in a house. The house, in turn, is connected to the electrical generator that is operated by a local electrical power producer. Designing an electrical circuit includes determining the voltage required by the application, determining the circuit configuration, and determining and calculating needed electrical components. Additional activities include prototyping the circuit design (assembling a sample circuit), performing quality-assurance tests, and making the circuits available for distribution.

If electrical technology fails to control electricity, then negative consequences can include accidents/misuse of electrically driven devices, human exposure to high voltages and radiation. In addition, the disposal of waste products from electrical power generating plants can adversely impact the environment.

ANALYSIS 11-1: An Analytical Overview of Electrical Technology

Use the four paragraphs at the beginning of this chapter and the list below to develop an analytical display. Include positive consequences. Include a vocabulary box at the bottom of your display.

- test and make necessary adjustments to circuit
- quality of life improved
- source of electricity
- perform quality assurance tests
- voltmeter
- to control electricity in the service of mankind
- resistor
- disposal of waste products produced by electrical generating plants

Vocabulary Box (explanation of terms):

electricity: electrical current used as a source of power

current: The amount of electrical charge flowing in a wire

electrical charge (also referred to as voltage): the electrical force that causes electrical current to flow or move through a wire resistor

load: a device that requires electricity in order to operate. In order for current to flow through the device, and thereby energize it, the voltage applied to the device must be sufficient to overcome the resistance provided by the device.

ANALYSIS 11-2: Introduction to Ohm's Law — Part 1

Here is a list of analytical elements associated with Ohm's Law. Use the list and develop an analytical display. Include the vocabulary box at the bottom of your display. When you finish this analysis, your display will not be complete. You will complete the display when you do Analysis 11-3.

- An Analytical Display of Ohm's Law
- circuit components can be properly selected
- current values
- voltage values
- can determine circuit parameters without need for actual measurement
- identify the three forms of Ohm's Law
- proper units
- convert to proper units
- resistance values

- to allow one to calculate the current, voltage, or resistance when any two of the three quantities are known
- Ohm's Law
- apply the appropriate form of Ohm's Law to calculate current, voltage, or resistance.
- V = IR

Vocabulary Box (explanation of terms):

voltage: the electrical charge that causes electrical current to flow or move through a wire, measured in volts and represented by the symbol "V"

current: the amount of electrical charge flowing in a wire; represented by the symbol "I"

resistance: the amount of opposition that a load presents to the current passing through it, measured in ohms and represented by the symbol "R"

ANALYSIS 11-3: Introduction to Ohm's Law — Part 2

Use the analytical narrative material below and complete the analytical display you started in Analysis 11-3.

An Analytical Narrative of Ohm's Law

The purpose of Ohm's Law is to allow one to calculate the current, voltage, or resistance when any two of the three quantities are known. The resources needed to accomplish this are the proper form of Ohm's Law and values of the resistance, voltage, or current as the case may be. Resistance values are in ohms, voltage values are in volts, and current values are in amperes.

The activities involved are to identify what is known about the circuit, identify what is unknown, select the appropriate form of Ohm's Law to solve for the unknown, and then make the calculations to solve for the unknown. The three forms of Ohm's Law are as follows:

1) I = V / R 2) V = IR 3) R = V / I

If you know the voltage (V) in a circuit and the resistance (R) of the load, then you can calculate the current flowing in the circuit by using the formula I = V/R. If you know the current (I) flowing in a circuit and the resistance (R) of the load, then you can calculate the voltage (V). If you know the circuit voltage (V) and the circuit current (I), then you can calculate the resistance of the load (R).

Positive consequences of using Ohm's Law include all of the following: Circuit components can be properly selected. Electrical appliances, machines, and devices can be designed, manufactured, and sold. One can determine circuit parameters without the need for actual measurements.

Negative consequences will result when you cannot calculate current, voltage, or resistance using Ohm's Law. These include using wrong size components which can lead to circuit malfunction and, perhaps, a fire.

ANALYSIS 11-4: Applying Ohm's Law — An Illustration

To solve the following problem, we shall use the same problem-solving approach used in chapter 10. The solution to this problem is shown in the analytical display below.

Part A: Read and Understand the Problem Information

The Situation: An electrical circuit uses 0.6 amperes to operate a light bulb. The circuit voltage is 220 volts.

The Problem: Calculate the electrical resistance of the light bulb.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves or sets up a solution to the problem. Make sure to evaluate your answer.

Title: An Analytical Display to Calculate Resistance Using Ohm's Law

(1) Purpose (Why?)
- To calculate the electrical resistance of a light bulb

(2) Resources (What is needed?)
- circuit voltage (V) is 220 volts
- circuit current (I) is 0.6 amperes

(3) Activities (What is done?)
(1) Identify what is known about the circuit:
- V and I

(2) Identify what is unknown:
- R

(3) Select the appropriate form of Ohm's Law to solve for the unknown:
- R = V / I

(4) Make the calculations to solve for the unknown:
- R = 220 / 0.6 = 366.6 ohms

(5) Evaluate the answer:
- Because the denominator is less than one, the answer should be greater than the numerator. Because the answer 366.6 is greater than 220, the answer is at least in the right direction.

(4) Consequences (What can happen if purpose is/is not achieved?)

Positive (if purpose is achieved): Knowing the resistance of the light bulb makes it possible to determine how additional circuit loads will affect circuit performance.

Negative (if purpose is not achieved): If the resistance of the light bulb is not known, the effect of adding additional loads to the circuit on current flow cannot be determined.

ANALYSIS 11-5: Applying Ohm's Law — A Problem

Part A: Read and Understand the Problem Information

The Situation: An electrical heater has a resistance of 15 ohms. The current in the circuit is 7 amperes.

The Problem: Find the circuit voltage.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display that solves or sets up a solution to the problem. Make sure to evaluate your answer.

MECHANICAL TECHNOLOGY

ANALYSIS 11-6: Auto Body Repair — Part 1

Prepare an analytical display based on the following list of elements:

- customer is not satisfied
- check manual for dimensions
- repaired vehicle is safe to drive
- shop facility
- straighten metal
- personnel
- to repair a vehicle damaged in collision
- equipment
- assess damage
- materials
- set up equipment
- damaged vehicle
- crash manual
- perform follow-up on straightening operations
- perform finishing process
- change into uniform
- vehicle is unsafe to drive.

ANALYSIS 11-7: Auto Body Repair — Part 2

You are now going to extend your understanding of auto body repair. Read the following narrative material. When you come across a topic or some information that is not in the display that you developed in Analysis 11-6, mark the topic. When you have completed reading and marking the narrative, transfer your markings to the display you developed in Analysis 11-6.

For example, the following narrative contains the statement: "The damaged vehicle is positioned on the rack and anchored with fastening devices and chains." You would add it to the display that you developed in Analysis 11-6.

Auto Repair Basics

A good shop facility contains a uni-body straightening device for correcting damaged areas by application of hydraulic pulling force. The damaged vehicle is positioned on the rack and anchored with fastening devices and chains. Set-up of equipment is normally included in the estimated cost of repair.

Depending on the area affected by the collision, the pulling force is directed in reverse of the way it occurred. Several hook-ups may be necessary at differing heights and angles.

As movement is observed in the corrective force and adjoining structures, the mechanic begins to apply the hammering principles with a hammer and dolly. As the work progresses, dimensions and measurements are taken, and checked according to the crash manual. Usually, datum lines are used with tape measure, centering gauges, and tram gauges. These are used to check progress until the repair is completed.

In many cases, the above procedure is the first stage in the repair cycle, followed by alignment, replacement of parts, and refinishing (painting) operations. The vehicle is then detailed, and wheel alignment is done. Finally, the vehicle is road-tested to insure that it is safe to drive.

[Note: Some terms in the analytical display may be new to you. Find out the meaning of any unfamiliar term. Define new words in a vocabulary box at the bottom of the analytical display.]

QUESTIONS

1. Compare the analytical display you developed in Analysis 11-1 with the one below. In every instance where the displays agree, check the display below. When you find an area of disagreement, decide which version is correct by analyzing whether the element is properly a purpose, resource, activity, or consequence.

Title: An Analytical Display of Electrical Technology

(1) **Purpose** (Why?)
- Improved quality of life through use of electrical devices and appliances, increased task efficiency compared to manual means, and the facilitation of basic research in many fields of science.

(2) **Resources** (What is needed?)
- source of electricity
- application that requires electricity (a "load")
- components
  - resistors
  - relays
  - wires
  - switches
- measuring devices
  - voltmeter
  - ammeter
  - ohmmeter

(3) **Activities** (What is done?)
- design the electrical circuit
  - determine required voltage
  - determine circuit configuration
  - determine and calculate size of needed components
- prototype the circuit design
- test and make necessary changes and adjustments
- manufacture circuit
- perform quality assurance tests
- make circuit available
- capacitor
  - oscilloscopes

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: To control electricity in the service of human beings.

Negative: Electrically driven devices can be misused and/or cause accidents; human exposure to high voltages and radiation is a danger; the disposal of waste products from electrical power generating plants can have a devastating impact on the environment.

2. Assume that you have a prototype of a circuit that includes a motor turning a conveyor belt. You notice that the belt is turning very slowly. According to your Ohm's Law calculations using motor resistance in ohms, the belt should be moving much more quickly. Can you identify what might be wrong electrically?

3. Write an analytical narrative for the updated analytical display on auto body repair that you developed in Analysis 11-7.

Chapter 12

Whole Learning in the Career Areas

ANALYTICAL LEARNING AND THE CAREER AREAS

The humanities give us artists, musicians, ministers, politicians, writers, historians, philosophers, gurus, and more. The social sciences give us counselors, teachers, social workers, public-relations experts, human resource managers, advertising designers, salespeople, lawyers, and others in a number of other occupational fields. The natural sciences give us biologists, chemists, research scientists and technicians, mathematicians, doctors, and nurses. The technologies give us electrical engineers, mechanical engineers, civil engineers, computer hardware and software designers, and technicians of many kinds.

The purpose of a career is to pursue a working path in a chosen occupation. A well-chosen occupation can be exciting and satisfying. An occupation that meets your interests and abilities can reward you personally and financially, providing income for you and your family. A poorly chosen career, one not suited to you, can result in boredom and frustration.

The resources needed to pursue a career include personal motivation, appropriate education and training in the selected occupation. You also require time and money to support your studies. Also needed are companies that require the types of abilities and skills for which you are preparing yourself, and an economy that will cause companies to hire new people.

The activities you engage in on a job include applying those skills and abilities for which you have been prepared. For example, if you have a job as an accountant, you will help keep and analyze the company's financial records. That accounting job will often require that you know how to use a microcomputer, so you will have to call on or develop computer skills. If you are applying electrical technology as an electrical engineer, you

might help design spaceships to visit other planets. If you are a doctor, you will help people to regain their health. If you are a nurse, you will help patients to reach their optimum state of health.

How can you know and understand career/occupational areas analytically? All occupations serve some purpose; people in them employ unique resources and engage in specialized activities. The purposes served bear consequences. With Whole Learning, you can study to prepare for these occupations while achieving a critical understanding of your field. You develop human, social, technical, communication, and critical and problem-solving abilities. These are the abilities that you must possess if you are to make it in the workplace in the 21st century.

Business

ANALYSIS 12-1: A Typical American Business

Develop an analytical display of the items listed below. All the elements that comprise an analytical display are included in the list: title, purpose, resources, activities, and consequences. Include the vocabulary box at the bottom of the display. Write an analytical narrative based on your analytical display.

- An Analytical Display of a Typical American Business
- land
- obtain financing
- business application software
- labor
- hire and train
- to make a profit and serve society
- business plan
- process information with business application software
- manage resources
- owners rewarded, jobs provided, tax revenue generated, consumer needs met
- capital
- produce product or provide service
- information
- owners can lose investment, workers can be unfairly treated, unsafe products can be marketed, and environment can be damaged
- sell the product or service

Vocabulary Box (explanation of terms)

capital: money or property that is used to produce more money or property

software: instructions to a computer (called a computer program) that allow a computer user to direct the computer to perform specific operations

business application software: a computer program that allows a computer user to apply computers to perform business operations, such as adding up account balances, writing a business letter, or keeping track of inventory stock

business plan: a report that shows a company's plans for making money

ANALYSIS 12-2: Hiring Employees

The analytical display you developed in Analysis 12-1 contains the activity "hire and train." In this analysis, you will develop an analytical pathway that focuses on hiring employees. (See chapter 7 for a discussion of analytical pathways.)

In this analysis, use your imagination, your logical thinking ability, and your understanding of Whole Learning to complete the following analytical display on hiring employees. Only the purpose has been provided. You figure out the rest.

Analyst: _____ *Date:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of Hiring Employees

(1) **Purpose** (Why?)

- to provide a company with a needed skill

(2) **Resources** (What is needed?)

(3) **Activities** (What is done?)

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

Negative:

Computer Information Systems

ANALYSIS 12-3: Business Application Software

The analytical display you developed in Analysis 12-1 contains the resource "business application software." In this analysis you will develop an analytical pathway that focuses on business application software.

On p. 177 is an incomplete analytical display. The entries in the following list contain the missing entries; place them in their appropriate locations.

- computer user
- spreadsheet operations [for making calculations]
- graph operations [for drawing graphs]
- to improve business efficiency and effectiveness [productivity]
- business application software [a computer program that allows one to work with (process) words, numbers, facts, or graphs]
- problems to solve
- database operations [for storing and retrieving facts]
- Possibility for mass distribution of errors. Operations limited to capabilities of application-software program. Software updates may require hardware updates.

Analyst: _____ Date: _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of Business Application Software

(1) Purpose (Why?)

•

(2) **Resources** (What is needed?)

- computer hardware [the memory of the computer, a monitor screen that shows the computer user what is in the computer's memory, and a printer]
-
- Disk Operating System [a computer program that allows the computer user to manage data files and use the business application software
-

(3) **Activities** (What is done?)

- word processing operations [for producing documents]
-
-
- integrated operations [for combining words, numbers, facts, and pictures into a single document]
- system operations [for controlling how the computer operates]
-

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: Business operations are speeded up, decision-making is aided, and problem-solving is assisted.

Negative:

Vocabulary Box (explanation of terms)

computer memory: that part of the computer hardware that stores instructions and application data files. For example, memory might hold a word processing program (the instructions) that allows the user to write a letter (the data file).

ANALYSIS 12-4: Business Application Software Narrative

Write an analytical narrative for the analytical display that you completed in Analysis 12-3.

ANALYSIS 12-5: Spreadsheet Operations

As you discovered in Analysis 12-3, one type of business application software concerns spreadsheets. A spreadsheet is used to make a variety of mathematical calculations. An electronic spreadsheet can help a computer user perform such operations as adding columns of numeric values or figuring the interest on a loan.

In this analysis, you will obtain a general overview of spreadsheet operations. For this analysis, we will use the entry "spreadsheet operations" in the analytical display of business application software in Analysis 12-3 to start a new analytical pathway for spreadsheet operations.

1. Develop an analytical display of the items listed below:
   - An Analytical Display of Spreadsheet Operations
   - computer hardware
   - enter titles, labels, numeric values, and formulas in the spreadsheet
   - spreadsheet software
   - If the spreadsheet printout is not acceptable, then the need is not fulfilled and additional problem-solving time and effort will be required.
   - bring a blank spreadsheet to the screen
   - save and print the spreadsheet
   - user
   - to produce a spreadsheet printout that reflects a solution to a problem
   - spreadsheet layout sketch [a rough sketch of what the spreadsheet is to look like]
   - If the spreadsheet printout is acceptable, then you [and your department, your company, your organization], have solved a problem. You can proceed to the next task at hand.
   - revise and correct the spreadsheet as necessary
   - load the spreadsheet software into the memory of the computer
   - a numerically oriented problem to solve
2. Now analyze the following paragraph and add any elements of purpose, resources, activities, and consequences to the display that you developed above.

An electronic spreadsheet is used to facilitate making calculations. When looking at a computer monitor, an electronic spreadsheet appears as a table with columns along the top (lettered A, B, C, and so on) and rows down the left side (numbered 1, 2, 3, and so on). Once numeric values have been keyed into the spreadsheet, the values can be added, subtracted, or otherwise arithmetically manipulated.

3. Write an analytical narrative based on your completed analytical display.

ANALYSIS 12-6: The Spreadsheet on the Computer Screen

Here is how a typical electronic spreadsheet appears on a computer screen. The columns are lettered. The rows are numbered. The intersection of a column and a row is called a *cell*. Notice that cell A3 contains the label "Sales." Notice that cell B5 contains the numeric value "756."

	A	B	C	D	E	F	G
1							
2							
3	Sales						
4							
5		756					
6							
7							
8							
9							
10							

Write these values in the cells above (do not write the quotation marks): In cell B3 write "Jan." In cell C3 write "Feb." In cell D3 write "March." In cell C5 write "800." In cell D5 write "650."

Whole Learning in the Computer Lab

ANALYSIS 12-7: The Solution to a Spreadsheet Problem

Part A: Read and Understand the Problem Information

The Situation: A wife works as an accountant at $22,000 per year. Her husband attends graduate school at a nearby university. Their monthly expenses are as follows: Rent - $344, Food - $280, Baby-sitting - $100, Utilities - $200, Books - $30, Tuition - $200, Clothing - $200, Travel/Auto - $200.

The Problem: Use an electronic spreadsheet and develop a 6-month budget for the couple. Calculate the cash available on a month-by-month basis.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

The analytical display shown on the next page is typical of the display that you would develop to help solve the problem. The display shows the purpose of the problem at hand, the resources given in the problem statement and those needed in the computer lab, the activities to be performed at the computer, and the anticipated consequences.

Title: An Analytical Display for Solving the Budget Problem

(1) **Purpose** (Why?)

- to develop a 6-month budget
- to calculate the cash available on a month-by-month basis

(2) **Resources** (What is needed?)

Resources Given in Problem Statement

- Yearly income = $22,000
- Monthly Costs:
  Rent- $344
  Food - $280
  Babysitting - $100
  Utilities - $200
  Books - $30
  Tuition - $200
  Clothing - $200
  Travel/auto - $200

Resources Needed in Computer Lab

- microcomputer system
- printer
- spreadsheet software
- data disk

(3) **Activities** (What is done?)

1. Develop the Budget
   - label column A "Item"
   - list in column A the names of all the expense items
   - label the next 6 columns "January" through "June"
   - enter the actual numeric values for each expense item for each month
2. Calculate Monthly Cash Available
   Do the following for each month:
   - calculate the monthly income ($22,000/12)
   - calculate the monthly expenses
   - subtract the monthly expenses from the monthly income to obtain the monthly cash available
   - put formulas in the appropriate cells
3. Change column widths as necessary, format for dollar signs, format for decimal places
4. Save the spreadsheet
5. Print the spreadsheet
6. Evaluate the answer

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: (1) The couple will know whether their monthly income will cover their monthly expenses. (2) The couple can use the budget to guide their spending. (3) The couple will know what adjustments in spending they may need to make.

Negative (if purpose is not achieved): (1) Without a budget, the couple will have poor knowledge of whether their monthly income matches their monthly expenses. (2) The couple is likely to overspend in those months when the cash available is zero or close to zero.

Note: Before working with the computer, it is a good idea to turn steps 1 and 2 under "Activities" into a pencil-and-paper sketch. The sketch will help you to understand the problem better. The sketch will also help you to develop the formulas needed to solve the problem.

ANALYSIS 12-8: Enter Values in the Spreadsheet

Assume that you are looking at a computer screen and you see the blank spreadsheet shown below. Refer to the analytical display shown on p. 181, and do steps 1 and 2 under "Activities." Use a pencil to make entries. Do the activities for the months of January, February, and March only. Remember, you can make entries only where a column and a row intersect to form a cell.

	A	B	C	D	E	F	G
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

ANALYSIS 12-9: A Spreadsheet for Monthly Sales

Part A: Read and Understand the Problem Information

The Situation: The Kitchen Products Company had the following monthly sales (in millions of dollars) for 19xx: January, $45; February, $60; March, $57.

The Problem: Find (1) the total of all sales, and (2) the average monthly sales.

Part B: Use an Analytical Display to Set Up a Solution to the Problem

Develop an analytical display to help solve the problem. Perform all the activities called for in the display.

To help get you started, here is a partial analytical display. Use the display in Analysis 12-7 as a guide and complete the display. Follow the activities in your display and complete the spreadsheet table shown below.

Title: An Analytical Display of Product Sales for the First Three Months of 19xx

(1) Purpose (Why?)
- to find total sales
- to find average monthly sales

(2) **Resources** (What is needed?)
- January sales = $45 million

(3) **Activities** (What is done?)

(4) **Consequences** (What can happen if purpose is/is not achieved?)
Positive:

Negative:

	A	B	C	D	E	F	G
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Nursing

ANALYSIS 12-10: Introduction to Nursing

Develop an analytical display based on the following material. If you discover that the display is incomplete, add any missing elements.

> The purpose of nursing is to help patients reach their optimum state of health. If this purpose is achieved, then the nurse is able to meet the patient's needs and the patient's quality of life is improved. To accomplish the purpose, the nurse needs a patient, health data on the patient, and a health-care facility. To help patients, a nurse will collect objective and subjective data, analyze the data, formulate a diagnosis, decide on realistic goals and outcomes, and evaluate the effectiveness of the care provided.

ANALYSIS 12-11: Blood

This analytical display has misplaced entries. For example, "clear airways" is a resource, yet it is shown as an activity. (In this case, "clear" is an adjective, not a verb.) There are other such errors. Find the errors, write out a correct display, and write a narrative for your display.

Analyst: _____ Date: _____

Source of Raw Subject Matter: _____

Title: blood picks up nutrients and oxygen

(1) Purpose (Why?)
- An Analytical Display of Blood
- to rid body of waste material

(2) **Resources** (What is needed?)
- effective heart
- patent arteries
- waste products are picked up by blood

(3) **Activities** (What is done?)
- food, oxygen taken in
- food broken down, oxygen diffused
- clear airways
- blood delivers nutrients and oxygen to tissues
- blood delivers waste products to elimination system and lungs
- appropriate diet
- if purpose is achieved, body tissue is maintained and repaired

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: oxygen

Negative: to deliver oxygen and other nutrients to body tissue. If purpose is not achieved, body tissue is not maintained and repaired, and tissues die.

QUESTIONS

1. Use your imagination, your logical thinking ability, and your understanding of Whole Learning to complete an analytical display on "Selling a Product." Your statement of purpose should *not* be "to sell a product." Ask yourself "What is (are) the purpose (purposes) of selling a product?" Use that answer as the statement of purpose in your analytical display. Then complete the rest of the display.

2. The situation: On Monday, the temperature (in degrees Fahrenheit) is 52. For the rest of the week, the temperatures are as follows: Tuesday, 72; Wednesday, 62; Thursday, 65; Friday, 50, Saturday, 74; and Sunday, 70.

   The Problem: What is the average temperature for all seven days? What is the average temperature for the weekend? What is the average change in temperature from day to day?

   (a) Develop an analytical display to solve this problem. The activities portion of the display is to address each of the three averages you are calculating.

   (b) Prepare a sketch of a spreadsheet showing columns and rows. Show how you would lay out your solutions on the spreadsheet.

3. Read the narrative shown below. (a) Develop an analytical display based on the narrative. The narrative does not contain consequences. You will have to add consequences to the display. (b) Answer the questions on p. 186.

Narrative Passage

A manager was asked to determine the average value of loans made by her bank. She asked the bank's accountant to gather the necessary data for the analysis. When shown the data, she said: "These data are for last year. Please bring me this year's data." The accountant gathered the correct data. The correct data were then analyzed using an electronic spreadsheet. The manager's analysis showed that the average loan value was less than that of a competing bank. The bank manager then lowered the interest rate for loans.

Questions

(a) What does the manager's statement in quotation marks represent?
a) purpose b) resource c) activity d) consequence

(b) What does the loan data gathered by the accountant represent?
a) purpose b) resource c) activity d) consequence

(c) What does the act of gathering the loan data represent?
a) purpose b) resource c) activity d) consequence

(d) Which of these does not belong?
a) manager b) electronic spreadsheet c) request for data
d) accountant e) none of the above

(e) How many resources are mentioned in the passage? (give best answer):
a) at least 2 b) at least 3 c) at least 4 d) at least 5
e) none is mentioned

(f) What resource is mentioned in line 1?

(g) What resources and activities are mentioned in line 6?

(h) The manager's purpose is to do what?
a) collect data b) calculate average loan value
c) lower the interest rate d) request an analysis
e) hire an accountant

(i) Did the manager accomplish what was requested of her?
a) yes b) no c) can' t tell from information given

(j) What led the manager to lower interest rates?
a) the accountant b) the other bank's interest rates
c) her calculations d) her supervisor e) none of these

4. The display on the next page uses several technical terms. The special words are "asepsis," "pathogens," "organisms," and "nosocomia." (a) Use a dictionary and write down the meaning of these words. (b) Write a narrative for this analytical display in which you include an explanation of each of the four technical terms.

Title: An Analytical Display of Medical Asepsis

(1) Purpose (Why?)

- to intervene and break the chain of infection through reduction of the number and transfer of pathogens

(2) **Resources** (What is needed?)

- gloves
- masks
- gowns
- red bags
- linen
- soap

(3) **Activities** (What is done?)

- wash hands
- make beds
- apply barriers

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: Patients and staff are protected from harmful organisms.

Negative: Increase in the incidence of nosocomial infection.

Vocabulary Box (explanation of terms)

asepsis:

pathogens:

red bags: red-colored disposal containers that contain contagious waste material.

nosocomial:

Part 4

How to Write, Listen, and Speak Analytically

Chapter 13

How to Write Analytically

In your course work, you are often required to write research and term papers. At work and in life, you will always be gathering data and communicating ideas and information. Here is a procedure that will help you to become an analytical writer:

1. Identify the purpose of the piece you are writing.
2. Prepare an analytical outline.
3. Gather facts.
4. Write your piece.
5. Review and rewrite the piece.
6. Prepare, assemble, and proofread your paper.
7. Submit your paper on time.

IDENTIFY THE PURPOSE OF YOUR PAPER

Your main responsibility as an analytical writer is to have the reader understand what you have written. To accomplish this, you must first promote understanding in yourself. In the case of a term paper, if your intent is not clear in your own mind, it won't be clear either in your paper or your reader's mind. Because your reader is your instructor, your paper will receive a poor mark.

If your instructor provides a topic, then work that topic into a one-sentence statement of purpose. The statement must be (1) narrow in scope, (2) interesting to you, and (3) clearly stated in writing. Here is an exploratory process that shows you how to achieve all three.

ANALYSIS 13-1: Develop a Narrow Topic

Assume that your instructor has given the following instructions: "Write a five-page paper on unmanned outer space exploration in the last 15 years." Here is how to narrow the topic, using the question-and-narrow technique.

Questioning	Narrowing
1. Shall I discuss balloons, rockets, unmanned spaceships, or manned spaceships?	1. I choose unmanned spaceships because this selection directly addresses what my instructor wants.
2. Shall I discuss their design or their mission?	2. Why they were sent (the mission) sounds more interesting than design.
3. Shall I discuss those that orbit the earth or those that visit other planets?	3. Those that visit other planets sound more interesting than those that go in circles.

You could continue to question-and-narrow, but let's stop here. Notice that the topic has been narrowed so that it now reflects your interests.

The next step is to prepare a one-sentence statement of purpose. The information in this sentence comes from all your entries in the "narrow" column. Here is an example: "The purpose of this paper is to discuss the missions of unmanned space flights to other planets during the past 15 years." This sentence (this statement of purpose) is a big improvement of your instructor's original instructions.

When you develop a statement of purpose for your term paper, show it to your instructor for approval. When you write the paper, be sure to include the statement either in your paper's title or somewhere in the paper's first paragraph.

ANALYSIS 13-2: Practice in Narrowing Topics

Develop a statement of purpose by completing these columns for the topic of "Health in America." A leading question is provided to help get you started.

Questioning	Narrowing
1. Shall I discuss health care in general, or the health of a group of people such as women, men, or children?	1.
2	2.
3	3.

Statement of Purpose: _____

_____

Develop a purposeful statement by completing these columns for the topic "Protecting the Physical Environment." A leading question is provided to help get you started.

Questioning	Narrowing
1. Shall I discuss protection of air, water, plants, or animals?	1.
2	2.
3	3.

Statement of Purpose: _____

_____

ANALYSIS 13-3: Develop Your Own Topic

Sometimes, your instructor will not give you a writing topic. Instead, your instructor will ask you to originate a topic that is related to the subject matter you are studying. If you are stuck for an idea, here is a procedure you can use to generate a topic.

Take a piece of paper and prepare at least four columns as shown below. Open your class textbook to its table of contents. Into the first column, copy the chapter titles that interest you (or copy the title of every other chapter) from the table of contents. This will insure that you select a topic associated with the course material.

In the second column, enter *your own* hobbies or special interests. If you run out of entries before you reach the bottom of the column, just repeat the entries. In the third column, enter various numbered years (including some in the future). In the fourth column, enter the names of countries (or states in the United States). Here is a typical result for an introductory course in business management.

Chapter Title	*Hobbies/Interests*	*Years*	*Countries*
1. capitalism	1. sailing	1. 1850	1. Brazil
2. corporations	2. exercising	2. 1900	2. Canada
3. management	3. swimming	3. 1920	3. China
4. finance	4. stamps	4. 1950	4. England
5. production	5. dancing	5. 1960	5. France
6. marketing	6. sailing	6. 1970	6. India
7. personnel	7. exercising	7. this year	7. Nigeria
8. computers	8. swimming	8. 1999	8. Russia
9. responsibility	9. stamps	9. 2010	9. U.S.A.

Now randomly select a series of four numbers from 1 through 9. You can do this by opening your textbook to four different pages and copying down the last digit in the page number. Say you obtain the sequence 4-6-2-9. This corresponds to the entries Finance - Sailing - 1900 - United States. You now have an idea for a term-paper topic. For example, you might say "The purpose of this paper is to show how United States boat owners financed the building of sailing vessels in the period around 1900."

If you don't like the result, repeat this process with four other numbers. Do this until you hit upon a combination that holds special appeal for you. Usually, once or twice through is enough to get ideas flowing. Go with whatever appealing idea comes into your head. If your topic needs narrowing, use the procedure described in Analysis 13-1.

Students using this system report that they have turned their term paper assignments from boring tasks into exciting adventures. The reason for that is clear. This process assures the selection of a topic that holds special interest for you.

ANALYSIS 13-4: A Random Walk to Develop Your Own Topic

Select a textbook. Apply the procedure described in Analysis 13-3, and develop two statements of purpose that can serve as candidates for a term-paper topic.

Chapter Title	*Hobbies/Interests*	*Years*	*Countries/States*
1.	1.	1.	1.
2.	2.	2.	2.
3.	3.	3.	3.
4.	4.	4.	4.
5.	5.	5.	5.
6.	6.	6.	6.
7.	7.	7.	7.
8.	8.	8.	8.
9.	9.	9.	9.

First number combination: ___ ___ ___ ___

Statement of Purpose 1: To _____

_____

Second number combination: ___ ___ ___ ___

Statement of Purpose 2: To _____

_____

TURN AN ANALYTICAL DISPLAY INTO AN ANALYTICAL OUTLINE

The term "analytical outline" is another way of saying "analytical display." In previous chapters, you have written narratives based on analytical displays. You have seen how analytical displays serve as a comprehensive and critically thought-out outline for writing. Here is how to prepare an analytical display for a term paper. Unmanned space flight is used as a sample topic.

1. Obtain or prepare a blank analytical display.
2. Enter a title, "An Analytical Display for a Paper on Unmanned Space Flight to Other Planets during the Past 15 Years."
3. Now enter statements of purpose: The purpose of this paper on unmanned space flight is "to describe the new knowledge gained about outer space," and "to describe the experiments conducted." Notice that, as in all analytical displays, the statements of purpose flow directly from the title of the analytical display
4. For resources, enter all those that are needed to achieve the purpose. Publications of the National Aeronautics and Space Administration (NASA) is one resource. As you conduct your fact-finding, you will be able to identify other resources. When you do, add the resources to your display.
5. For activities, enter Introduction, Discussion, and Conclusion.

   In the introduction, you will state the purpose of your paper and what you hope to accomplish for the reader.

   In the discussion, you will write about the major activities that have taken place in unmanned space flight during the past 15 years. The chances are that this knowledge is not known to you, so you will add the activities to the display as your fact-finding proceeds.

   You want to adopt some logical pattern to frame your discussion of unmanned space flight activities. The logical pattern will help you to (a) identify what topics hold appeal, (b) clarify what you want to convey, (c) promote logical arrangement of your thoughts and, (d) bring the reader to your mind, a real person with whom you are communicating. See pages 46-53 for a discussion of logical patterns. If no logical pattern occurs to you at the outset, wait until you have done some research and use that material as a basis for establishing a pattern.

   In your conclusion, include a discussion of the consequences of space flight as well as your judgment about space flight and its future.

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6. Complete the consequences portion of the display with something like the following: "Positive: A better understanding of the new manufacturing techniques developed. Information about ages of stars gathered; Negative: 'Is money spent on space exploration worth the knowledge gained?' is a question that was revealed in researching this paper."

   These consequences are with respect to the purpose stated above in step 3: "to describe the new knowledge gained about outer space," and "to describe the experiments conducted." If consequences are not clear at this point, add them to the display as they are revealed to you through your research and fact-finding. Include the consequences you identify in the conclusion part of your paper.

Your analytical display is complete when your fact-finding is completed. At this point, you have an analytical display on which to base your writing. Here is a sample analytical display for writing a term paper:

Analyst: (your name) *Date:* (current date)

Subject: Term Paper *Topic:* Unmanned Space Flight

Source of Raw Subject Matter: (To be entered when you know what specific books and other materials you have used to research the paper. The entries you make here will appear in your bibliography).

Title: An Analytical Display for a Paper on Unmanned Space Flight to Other Planets during the Past 15 Years

(1) **Purpose** (Why?)

- to describe the new knowledge gained about outer space
- to describe the experiments conducted

(2) **Resources** (What is needed?)

Publications from:

- National Aeronautics and Space Administration
- U.S. Congress
- aerospace industry

(3) **Activities** (What is done?)

I. Introduction

A. Purpose of paper: to discuss the missions of unmanned space flights to other planets during the past 15 years.

B. What the reader can expect: In this paper, I shall identify the major unmanned space flights undertaken by the U.S. Governement during the last fifteen years, report the missions of these flights and the degree of success achieved, and discuss plans that NASA currently has for future flights.

II. Discussion

A. Purpose of Major Flights

B. Flight Missions

C. Mission Results

D. Future Plans

III. Conclusion

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: A better understanding of the new manufacturing techniques developed. Information about ages of stars gathered.

Negative: "Is money spent on space exploration worth the knowledge gained?" is a question that was revealed in researching this paper.

GATHER FACTS

Instructors are interested in more than your opinions and feelings only. They want to read your informed opinions. Informed opinions must be supported by facts and other data.

Here are four ways to gather facts and data:

1. Read books, magazines, and newspapers, and refer to computer databases. This is called bibliographic research.
2. Ask people questions. This is called interviewing.
3. Look at and listen to what is taking place. This is called observation.
4. Conduct a test. This is called experimentation.

Bibliographic research is discussed in Chapter 16. When interviewing people, write your questions down before you go to the interview. This will ensure that you get the information you want while not wasting the other person's time.

When doing research, be sure you can tell the difference among facts, inferences, and judgments. A *fact* is something that has happened. (George Washington was the first President of the United States). *Data* is any other information that can be precisely described. (The distance from here to the moon, the way digestion works, the floor plan for your home.) An *inference* is something said about the unknown (it will rain today) based upon the known (dark clouds are gathering). A *judgment* is a supported expression of approval or disapproval. (Joseph is reliable because he keeps his appointments.)

Facts and other data can be arranged to represent special interests. To minimize biased sources of information, make sure you do the following:

1. Gather information from *a variety of* sources.
2. Use information that is *up to date.*
3. *Report accurately* what you have found out.

ANALYSIS 13-5: Facts, Inferences, and Judgments

Read the first two paragraphs in Analysis 5-1, pp. 80-81, and then answer the following questions:

Identifying Facts

Mark each statement either "T" (true) or "F" (false) in the space provided.

1. ___ The story takes place in Florida.
2. ___ The college administrators found Lucinda academically qualified to attend college.
3. ___ In 1783, there were 100 colleges in America.
4. ___ The first American college was Yale.
5. ___ Harvard refused to admit Lucinda.
6. ___ The freshman class at Harvard contained only men.

Making Inferences

The following statements represent information that does not appear directly in the material. Use logic to decide whether each statement represents a likely or unlikely inference. Mark a "L" or "U" in the space provided.

1. ___ It is wintertime.
2. ___ Lucinda is a teenager.
3. ___ The president of the college is a woman.
4. ___ There were no women at all in college at that time.
5. ___ Lucinda left the building by herself.
6. ___ Lucinda eventually went to college.

Recognizing Judgments

Judgments are informed opinions. The following statements are judgmental. Decide whether each statement, based upon the facts given in the material, is a good or poor judgment. Mark "G" or "P" in the space provided.

1. ___ Lucinda's clothes were poorly made.
2. ___ Harvard was an excellent place to learn.
3. ___ English immigrants did not know very much.
4. ___ The administrators at Harvard were prejudiced.
5. ___ The American Revolution brought poor results for women.

WRITE YOUR PAPER

Having prepared the outline and gathered your facts, you are now in a position to write the first draft of the paper. Because of the nature of Whole Learning, your paper is likely to be a well-formed and comprehensive piece of research. It will also be critically constructed because it is based on an analytical display.

When writing, your main job is to be clear and concise. Sentences should be no longer than is necessary to convey one idea clearly and succinctly. Avoid sentences that are too long — *like this one* — because they contain too many words in dependent clauses which do not add anything to the main thought of the sentence, or that are repetitive, and that are not related to your main theme, anyhow.

If you want to supplement your main points, write short, simple sentences. Use footnotes[1] sparingly. Footnotes usually are either references or additional information.

REVIEW AND REWRITE YOUR PAPER

After you have keyed the first draft, put your paper away for at least a day. Review your paper for clarity, misspellings, and misstatements of information. You can also show your draft to someone else — your editor. Ask that person to mark the areas that are not clear or that contain errors.

As all good writers know, "All writing is rewriting." Do not hesitate to reorganize for better focus, rewrite for greater clarity, or delete words that are unnecessary. Take your editor's and your own critiques of your paper seriously; rewrite accordingly.

PREPARE, ASSEMBLE, AND PROOFREAD YOUR PAPER

After the rewrite, carefully type or print out your paper. Follow the format required by your instructor. Include a list of your references, a bibliography. Here is a typical bibliographic entry, but there are many styles:

> Maiorana, V. P. *Critical Thinking across the Curriculum — Building the Analytical Classroom.* Bloomington: ERIC/REC at Indiana University, 1992.

As shown above, a bibliographic entry includes the name of the author, the name of the book, the place of publication, the name of the publisher, and the date of publication.

After you have typed/printed out your paper, either you or a friend proofread it for typographical errors. You may either correct errors in the final draft with a pencil or you

[1] This is an example of a footnote. A footnote is placed below a line at the bottom of a page. A footnote is a citation of a reference or contains information that supplements the main text. Footnotes are usually numbered. The rule of thumb on using footnotes is this: Anything worth saying is worth saying "above the line" in the text itself. Use footnotes only when you have to.

may print out a clean copy. Bear in mind that correcting typographical errors with a pencil is usually acceptable for term papers, but it is generally not acceptable in the workplace.

SUBMIT YOUR PAPER ON TIME

"On time and under budget" is everyone's goal in the workplace. Develop the winning workplace habit of meeting your deadlines. If you meet dates and times, you will be perceived as (and you will actually be) reliable. Learn it in class; do it in life.

Reading term papers is a demanding task for your instructor. Most instructors set aside a special time and place to grade papers. Papers that are handed in late cost the teacher extra time and effort. Hand your paper in late, and you make problems for your instructor. Problem papers deserve lower grades. Hand it in on time, and you reap the rewards.

EXERCISES

1. Here is a list of term-paper topics. Select three entries from the list and develop a statement of purpose for each. Use the narrowing technique described in Analysis 13-1.
   - abortion
   - automobiles
   - careers
   - community service
   - developing countries
   - the economy
   - environment
   - federal government
   - hunger
   - music
   - space travel
   - war
   - AIDS
   - books
   - children
   - crime
   - discrimination
   - education
   - family
   - health
   - marriage
   - religion
   - television
2. Select one of the purpose statements you developed in answer to exercise 1. Use the statement to develop an analytical display.
3. Collect necessary facts and other data and write the term paper for the display you developed in answer to exercise 2.
4. Show your answer to exercise 3 to a classmate, friend, or family member. Ask that person to read the paper. Ask that same person to mark those portions of the paper that are unclear to him or her.
5. Revise your paper to reflect the comments you received in answer to exercise 4.

Chapter 14

How to Listen Analytically

The first test you take in a classroom is not given by your instructor. The first test you take on the job is not given by your boss. The first test is given by you yourself to yourself. You give yourself the same test each time the class meets. The test has one question, and that question is: "Can I listen, take notes, and ask questions in class so that I can maximize my knowledge and understanding of the subject matter?" This is the purpose of the classroom, and Whole Learning will help you achieve the purpose.

WHY IS THE CLASSROOM IMPORTANT ?

Relatively little time is spent in class compared to the great amount of learning that you do outside of class. Does this mean that class is not important? "If the material is already in the text and I know how to study a text, why should I bother to attend class in the first place?" The answer is that texts are limited. They do not address the situations listed below. These situations relate to your *competency* in the subject matter, your learning *awareness,* and your *flexibility* in dealing with others and with subject matter. if you are competent, aware, and flexible, you can do the following:

Be Competent

- Find out what is important to know and understand in the course.
- Determine whether all of the course material is in the text.
- Get help if you don't understand the text.
- Obtain information on assignments and special projects.
- Know what to emphasize when you study the text.
- Find out the latest developments regarding the subject.

- Determine whether exams will cover class notes or textbook readings or both.
- Get answers to your questions.
- Find out what will exams be like.
- Learn the underlying ideas that tie together all the course material.

Be Aware

- Network: find a group of people with whom you can talk and study who are interested in the same subjects you are interested in.
- Investigate career opportunities.
- Take an accurate measure of your level of achievement and discover new ideas and new ways of looking at the world.
- Meet others different from yourself; cross the cultural boundaries so that you can work with anyone.

Be Flexible

- Develop the ability to work with others in an organized fashion.
- Test your understanding and show what you know.
- Learn to socialize with people.
- Find a friendly environment where you can develop confidence in speaking.

NECESSARY CLASSROOM SKILLS

Here is an analytical display of classroom operations:

Title: An Analytical Display of Classroom Operations

(1) Purpose (Why?)
- to listen, take notes, and ask questions in class

(2) **Resources** (What is needed?)
- attributes of a good classroom listener
- notebook
- pen or pencil

(3) **Activities** (What is done?)
- listen
- take notes
- ask questions
- be sociable

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: Notes can be reconstructed to obtain an analytical understanding of the subject matter.

Negative Wasted time, no basis for new learning.

Here is a discussion of the key elements in the foregoing analytical display:

ATTRIBUTES OF A GOOD LISTENER

Hearing is physical; listening is intellectual. Hearing is simply receiving sound. Listening is following and understanding sound. Listening is hearing with a purpose. The following exercise demonstrates the attributes of a good listener.

EXERCISE 14-1: Listen for Understanding

Form groups of three people. Have one group member read ALOUD Situation 1 below and its remedy, while the others take notes on the main ideas. Record the ideas in your notebook. Make two columns. Label one "Situation" and the other "Remedy." Members will take turns reading a situation and its remedy.

Situation 1. Mind-Wandering: Experiments show that most people prefer to receive spoken words at an average of about 175 words per minute. While this may be comfortable, it allows time for your mind to wander. This occurs because your mind can process words faster than someone's physical ability to say them.

Remedy: To minimize mind-wandering, use these techniques:

1. Take notes. You will soon forget most of what you listen to. Notes serve as a permanent record.
2. Listen analytically. Be alert for statements of subject-matter purpose, resources, activities, and consequences.
3. Look directly at your instructor. This helps focus your attention and allows you to observe visual clues that add meaning to what is being said.
4. Ask questions. Aside from getting an answer, asking questions keeps you centered on the topic and speaker.
5. Read the assigned material before attending class. Identify questions before you go to class. Listen for the answers. Ask more questions to get clear answers.

Situation 2. Look for Signs of Organization: Most lectures are organized according to some plan. Lectures usually follow a sequential topic outline format. This organization may not be obvious, although you can recognize clues provided by the speaker.

Remedy: Observe, understand, and adapt to the speaking and teaching style of your instructors. Look for spoken and visual clues. The teacher may write the topics on the chalkboard or orally identify them. If so, you have the main lecture ideas. To signify main points, instructors will often identify them as such, change the tone of voice, or shift body position. Some clues are obvious, others are not; practice recognizing them. The organization of the lecture will become more apparent to you, if you pay attention to these details.

Situation 3. Words and Biases: Your personal culture, education and experience mean that you will give your own special meaning to words. This includes abstract words such as *love, democracy, management, education,* and *listening.* The meaning you attach to words, and the biases that result from personal views, can prevent you from acquiring new learning.

Remedy: Recognize that all people, including yourself, hold biases with respect to the words used to describe things, ideas, and people. Regardless of the source, you should try to understand words and ideas even when they do not fit your existing views and understandings. You can, of course, simply accept or dismiss words or ideas that you don't understand or that don't fit your own point of view. But if you treat new information in a biased fashion, aren't you also dismissing the very reason for being in class, namely, to learn something new?

Situation 4. Classroom Openness: Your personal evaluation of an instructor can prevent new learning. If you like an instructor, you are apt to accept what he or she says. While that may be comfortable, it may not be intellectually wise. An instructor you don't like might nevertheless have valid and important things to say.

Remedy: Do not prejudge what an instructor can contribute to your learning. You can be biased for or against something or someone. Whichever it is, the ability to recognize that you do hold biases is necessary, if you are to be open to new information, new ideas, and new people. Openness to the new promotes learning.

TAKING NOTES

The Notebook

Consider these points when purchasing a notebook:

- Loose-leaf books have more flexibility than do bound books. Loose-leaf books can be more easily divided and expanded to accommodate the notes taken in each course.
- If you are taking a math or science course, graph paper will help you when drawing diagrams and graphs.
- A 8 x 11-inch paper size is better than smaller sizes because you can record more related ideas on a single page.
- Make sure you always bring a pen or pencil (and a spare) to class.

What to Record in Your Notebook

The purpose of taking notes is to make a record of what you consider important. How do you know what is important?

Listen very closely to the opening remarks of your instructor. Some teachers state the purpose of the topic under discussion during the opening remarks. However, the instructor may say, "The topic for today is human blood," but then continue without stating the purpose of blood. In that case, and when it seems appropriate, you can say: "I understand that the topic is blood, but what is the purpose of blood?" You can also ask questions concerning the consequences of achieving the purpose of the topic under discussion.

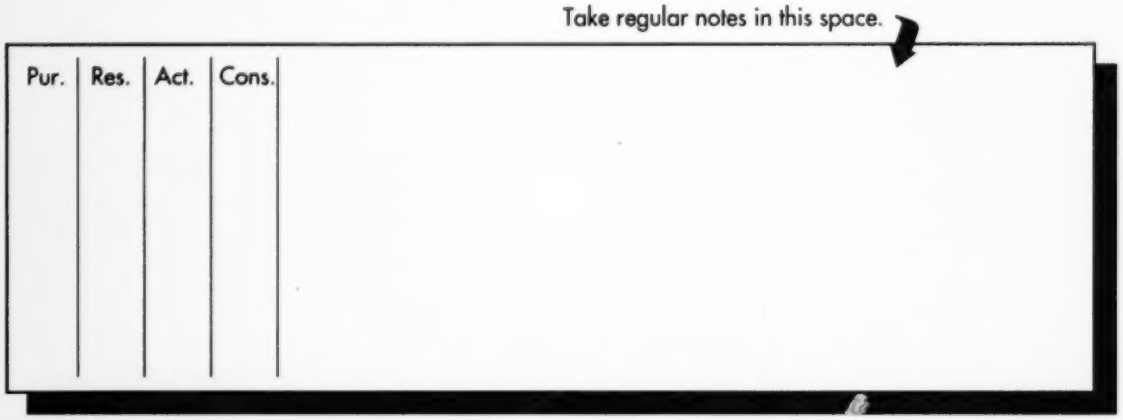
Your instructor will often indicate what is thought to be important by emphasizing points in the following manner:

- writing them on the chalkboard
- emphasizing them by asking questions or by saying, "Now this is important" or "The three main ideas are ..." or "This is a point to remember"

How to Record Your Notes

Format the page

Divide the note sheet as follows:



Use thought organizers

Record notes in outline format. You can use a modified topic outline, dot/dashes, or a combination of the three. See Chapter 3 for a discussion of these logical thought organizers.

Write clearly

Notes are for study later, so they must be clearly written. Print your words if necessary.

Abbreviate

Abbreviate terms that are likely to occur often during a lecture. For example, if the term *computer* keeps recurring, write *cr = computer* and then use cr in the remainder of your notes for that lecture. Do the same with names, places, and ideas that are likely to occur often. After a few class meetings, you should be able to develop your own shorthand for each course.

Here are some abbreviations you can use:

std = standard	bus = business	e.g. = for example
def = definition	gvt = government	∴ = therefore
inf = information	eco = economics	+ = and
Eng = English	psy = psychology	w/ = with

Key your notes: Soon after the lecture (or during the lecture, if possible) check-mark in the left-hand columns the analytical elements of purpose, resources, activities, and consequences. This helps you (1) to maintain an analytical, not a rote, interpretation of the discussion, and (2) to reconstruct your notes easily into an analytical display after class.

When taking notes in class, it is more important that you take down the material than to categorize it as purpose, resources, activities, or consequences. The notes you take are considered "raw material, " like the material in a textbook. When class is over, during study time, you will analyze your notes in the same way you learned to analyze paragraph and textbook material in chapters 2 through 6, above.

Questioning

"If I ask a question in class, then the teacher will think I don't know the material." "What happens if the teachers makes fun of me and the other students laugh?" "I hate to ask questions in class; I may appear foolish." Who likes to be embarrassed? Nobody! This is a natural fear, and every one of your classmates feels the same way. Asking questions in class, however, is not likely to lead to embarrassment. Here's why.

- Most instructors like questions. Questions show that the student is paying attention. Questions allow teachers to judge how well the material they are conveying is understood.
- If you have a question about the material, chances are that the other students do also. Asking questions, therefore, probably helps out your classmates.

Ask the question when it first occurs to you. If you delay, you may forget it. If you delay, moreover, the answer you receive may not be in the context of what originally brought the question to mind. It may take a bit of courage to break through and ask

questions in class. But asking questions will allow you to achieve the understanding you go to class to gain.

EXERCISE 14-2: Afraid to Ask?

Take a chance! Compare your fear of asking questions in class with that of your classmates. Use the scale below to register your degree of agreement or disagreement with the statements listed below the scale. First, work by yourself.

Scale

0 strongly disagree with statement

1 disagree with statement

2 neutral about statement

3 agree with statement

4 strongly agree with statement

In regard to asking questions in class, I am worried about...

___ freezing up and stopping in mid-sentence

___ revealing that I don't know something

___ being ridiculed by the teacher

___ being ridiculed by other students

___ being asked to repeat the question

___ being told that I should already know the answer

___ not being able to think clearly

___ my voice trembling or breaking

___ appearing foolish

___ expressing my opinion

Now, form groups of about five people. Discuss the responses made by group members. Identify three items that group members have rated at 3 or 4. For these items, have the group draw up a list of suggestions to help overcome the fear of being embarrassed.

Sociability

Sociability is the quality of being with people in an agreeable manner. It is important to relate positively to your classmates. The classroom is an excellent place to make friends and find study partners. You will meet life's challenges in the company of

others for the rest of your life. The classroom is a good place to learn to meet these challenges.

DEVELOPING AN ANALYTICAL VIEW OF YOUR CLASS NOTES

Taking accurate and full notes is important, but your notes are only raw material. They need to be transformed into an analytical display. Do this during your study time. Treat your notes like paragraphs in a textbook and reconstruct them using Whole Learning. Analytical reconstruction of your notes generates several advantages:

- ✦ You will avoid becoming a rote memorizer and you will become an analytical learner.
- ✦ The analytical displays you develop from your notes can be used to complement the displays you make, based on the corresponding textbook material.
- ✦ If you cannot develop a complete analytical display based on your notes, then look in the textbook for missing display elements. If you still need help, then show your display to your instructor. Even though your instructor may not be familiar with Whole Learning, if you present a clearly labeled and neatly written display, you will most likely get the help you seek.
- ✦ Use the analytical displays to review for exams.

QUESTIONS

1. What is the difference between hearing and listening?
2. What is the purpose of listening in class?
3. Name five reasons for the importance of the classroom.
4. List four situations and four remedies associated with listening for understanding.
5. You want to reconstruct your class notes analytically. Sketch here how you would format a blank page in your notebook.

Chapter 15

How to Speak Analytically

In school you will be required to do research and deliver oral reports. At work and in life, you will always be gathering data and communicating ideas and information orally.

The time to be at your analytical best is while preparing your report. Follow the procedure for preparing and delivering an oral report. (This procedure is very close to the analytical writing procedure described in Chapter 13.)

1. Identify the purpose of your oral report.
2. Prepare an analytical outline.
3. Gather facts.
4. Write out your oral report.
5. Review your oral report.
6. Practice your oral report.
7. Deliver your oral report.

IDENTIFY THE PURPOSE OF YOUR ORAL REPORT

Your main responsibility as a speaker is to have your audience understand what you say. Before you can promote understanding in your audience, you must first promote it in yourself. In the case of an oral report, if the purpose is not clear in your own mind, it will not be clear to your audience, either.

Select a topic and then prepare a one-sentence statement of purpose. The statement must be (1) narrow in scope, (2) interesting to you, and (3) clearly stated in writing. (See chapter 13, Analyses 1, 2, 3, 4.)

PREPARE AN ANALYTICAL OUTLINE

Here is how to prepare an analytical outline. Unmanned space flight is used as the sample topic.

1. Obtain or prepare a blank analytical display.
2. Enter a title: "An Analytical Display for an Oral Report on Unmanned Space Flight to Other Planets during the Past 15 Years"
3. Now enter purposeful statements: The purpose of this report is "to describe new knowledge gained about outer space," and "to describe the experiments conducted." Notice that in all analytical displays, the statements of purpose flow directly from the title of the analytical display.
4. For resources, enter all those that are needed to achieve the purpose. Publications of the National Aeronautics and Space Administration (NASA) is one resource. As you conduct your fact-finding, you will be able to identify other resources. When you do, add the resources to your display.
5. For activities, enter Introduction, Discussion, and Conclusion.

   In the introduction, you will state the purpose of your speech and what you hope to accomplish for the audience.

   In the discussion, you will write so that you can talk about the major activities that have taken place in unmanned space flight during the past 15 years. The chances are that this knowledge is not known to you, so you will add the activities to the display as your fact-finding proceeds.

   You want to adopt some logical pattern to frame your discussion of unmanned space flight activities. The logical pattern will help you (a) to identify what those topics should be, (b) clarify what you want to convey, (c) promote logical arrangement of your thoughts and, (d) bring your audience to your mind, the faces of those real persons with whom you will be communicating. If no logical pattern occurs to you at the outset, wait until you have done some research, and then use that material as a basis for establishing a pattern.

   In your conclusion, include a discussion of the consequences of space flight as well as your judgment about space flight and its future.
6. Complete the consequences portion of the display: "Positive: A better understanding of the new manufacturing techniques developed. Information about ages of stars gathered; Negative: "'Is money spent on space exploration worth the knowledge gained?' is a question that was revealed in researching the talk."

These consequences are with respect to the purposes stated in step 3 above: "to describe new knowledge gained about outer space," and "to describe the experiments conducted." If consequences are not clear at this point, add them to the display as they are revealed to you through your research and fact-finding. Include consequences that you identify in the conclusion part of your talk.

Your analytical display is complete when your fact-finding is completed. At this point, you have an analytical display to use when you write out your oral report. Here is a sample analytical display for delivering an oral report:

Analyst: (your name) *Date:* (current date)

Subject: Oral Report *Topic:* Unmanned Space Flight

Source of Raw Subject Matter: (To be entered when you know what specific books and other materials you have used to research your oral report.

Title: An Analytical Display for an Oral Report on Unmanned Space Flight to Other Planets during the Past 15 Years

(1) **Purpose** (Why?)
- to describe new knowledge gained about outer space
- to describe the experiments conducted

(2) **Resources** (What is needed?)
- Publications from
  - National Aeronautics and Space Administration
  - U.S. Congress
  - aerospace industry

(3) **Activities** (What is done?)

I. Introduction
- A. Purpose of the oral report: to discuss the missions of unmanned space flights to other planets during the past 15 years.
- B. What the audience can expect: I shall identify the major unmanned space flights undertaken by the U.S. government during the last fifteen years, discuss their purposes, degree of success achieved, and plans for future flights.

II. Discussion
- A. Purpose of Major Flights
- B. Flight Missions
- C. Mission Results
- D. Future Plans

III. Conclusion

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: A better understanding of the new manufacturing techniques developed. Information about ages of stars gathered.

Negative: "Is money spent on space exploration worth the knowledge gained?" is a question that was revealed in researching this oral report.

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GATHER FACTS

Audiences are interested in more than your own opinions and feelings only. They want reliable information, as well. Informed opinions and enlightened feelings are your own thoughts supported by facts and other data.

There are four ways to gather facts and data:

1. Read books, magazines, and newspapers, and refer to computer databases. This is called bibliographic research.
2. Ask people questions. This is called interviewing.
3. Look at and listen to what is taking place. This is called observation.
4. Conduct a test. This is called experimentation.

Bibliographic research is discussed in Chapter 16. When interviewing people, write down your questions before the interview. This will ensure that you get the information you want, while not wasting the other person's time.

See chapter 13 for additional information on facts, other data, and distinguishing among a fact, an inference, and a judgment.

WRITE OUT YOUR ORAL REPORT

Having prepared the outline, you are now in a position to write the first draft of your talk. Because of the nature of Whole Learning, your speech is likely to be well-formed and comprehensive. It will also be constructed critically because it is based on your analytical display.

Using your analytical display as a guide, write out your talk on regular paper, or you can use 3x5 or 4x6 cards to note the main points that you want to make.

REVIEW YOUR ORAL REPORT

After you have prepared the notes that you will use during your talk, put them away for at least one day. Then review your notes for clarity, completeness, or misstatements of fact.

PRACTICE YOUR ORAL REPORT

Read through your notes several times to become familiar with the flow of ideas you want to present during your talk. Then pretend that you are standing in front of your audience, and deliver your talk. If possible, practice in front of friends or family members. Ask them to comment on how well you are making yourself understood.

When practicing your speech, bear in mind the points made below under "Deliver Your Oral Report."

DELIVER YOUR ORAL REPORT

You have two sets of main concerns when speaking to an audience. One is physical, the other mental.

Physical concerns include your appearance and how you use your voice, body, eyes, and head. An audience will react initially to your general appearance and your outward attitude. Dress neatly and have a cheerful manner. Relax, but don't slouch. If you stand, don't stand motionless in one spot — you'll look stiff and bore your audience. Move around and be lively, but avoid unnatural gestures and excessive mannerisms.

Speak clearly, distinctly, and loud enough for those in the back to hear you. Don't rush; take your time. Speak at about 100 - 150 words per minute. Vary your tone of voice. Use simple words and short sentences. Clearly indicate when you are going on to a new topic.

Look just above the heads of your audience, rather than looking down at the floor or up at the ceiling or out the window. Keep your head up to allow voice projection. Occasionally make eye-contact. If an audience is small, as in a classroom, you can make eye contact with every individual. Each one will feel as though you are making your talk "just for them." Speak to everyone, not just to your teacher. Keep in mind that you are delivering a talk to an audience and not to one person only.

Mental concerns include stage fright, audience response, handling of questions, and defensiveness. Stage fright is a natural jitteriness that usually goes away when the speaker gets going. Genuine fear may spring from your concern over doing poorly, especially if you are not well prepared. The best way to minimize fear is through proper preparation and practice. If you follow the seven steps outlined at the beginning of this chapter, then you will minimize fear because you'll be ready to go.

The last thing the audience wants is to be bored. It is therefore up to you to prepare an interesting and lively talk. Think of the audience as friends, not judges. Smile. Smiling makes a difference in both your own attitude and manner as well as your audience's, and it reduces fear.

Questions from the audience show that they are listening and that they are interested in what you have to say. Avoid being defensive when fielding questions. Defensiveness arises when you treat questions as if they were aimed at you personally and not pointed at the subject matter being discussed. Treat each question at face value. Provide the best answers you can. If you don't know the answer to a question, then say that you don't know. If it seems appropriate, you can offer to find out the answer.

Respect your audience. Inform and entertain them. Respect your audience by preparing well and being honest, by being interesting and enjoyable. They will respond to you and will be patient with any mistakes you make. You will make mistakes. Nobody's perfect. When you do make mistakes, it's not the end of the world.

QUESTIONS

1. Describe the steps in preparing an oral report.
2. What methods can you use to practice the delivery of an oral report?
3. Describe three physical concerns when speaking.
   How can you deal with them?
4. Describe three mental concerns when speaking?
   How can you deal with them?
5. What is the difference betwen stage fright and fear?
6. What is defensiveness and how can you avoid being defensive?
7. Here is a list of oral report topics. Select three entries from the list and develop a statement of purpose for each. Use the narrowing technique described in Analysis 13-1.

   - abortion
   - automobiles
   - careers
   - community service
   - developing countries
   - the economy
   - environment
   - federal government
   - hunger
   - music
   - space travel
   - war
   - AIDS
   - books
   - children
   - crime
   - discrimination
   - education
   - family
   - health
   - marriage
   - religion
   - television

8. Select one of the purpose statements you developed in answer to question 7. Use the statement to develop an analytical display.
9. Collect necessary facts and other data and prepare notes for your oral report based on the display you developed in answer to question 8.
10. Deliver your oral report to a classmate, friend, or family member. Ask that person to critique your presentation.
11. Revise your oral report to reflect the comments you receive.

Part 5

Managing Your School and College Career

Chapter 16

How to Develop Good Study Habits

Whole Learning will help you to think, read, write, listen, speak, problem-solve, and study while in school and later in your career and in life. There are other factors also that you must consider. These other factors address how you manage yourself. They include your use of time, talking to your teachers, using the library, and taking exams.

Your ability to manage yourself will help you get good marks. Developing self-management skills while in school is one of your main objectives. Self-management skills will also help you to manage your time and effort on your job.

Your ability to manage yourself is the most important factor in achieving your chief educational objective: ***to graduate***.

TIME

The letters in the word TIME hold a special meaning for you. T-I-M-E: **Time Is ME**. Time cannot exist without you. You cannot exist without time. There is no practical way of separating yourself from time, or time from yourself. Your time exists because you count and measure and organize it. Time is what you do, what you think, what you say. Time is what you use. You are your own time. Time cannot be anything or go anywhere without you. Although there are many dictionary definitions of time, you cannot define time until you define and redefine yourself. How you use time is how you define yourself.

How you define your study schedule will greatly affect your performance as a student. An effective study schedule can be designed in three steps:

1. Determine how much time you will spend studying.
2. Set up a study schedule.
3. Assess your use of the schedule.

ANALYSIS 16-1: Determine Your Study-Time Hours

To calculate the number of hours you have available to study, follow these steps and complete the table on the next page:

1. The first column in the table, "Activities," shows typical activities. If an activity does not apply to you, ignore it. If you engage in activities not shown, enter them on the blank lines.
2. In the "Example" column, you see sample numbers representing the hours spent each week doing the specified activity.
3. Each week contains 168 hours; that is why the third column starts out with "168." In a trial run, follow the "Example" column to calculate the hours available for study. Start by subtracting 14 hours for eating from 168 hours to find a remainder of 154 hours. Next, subtract 56 hours for sleeping from 154 hours to find a remainder of 98 hours. Continue in this way until you are left with a final remainder. In the "Example" column, this remainder is 26 hours — the "Time Available to Spend Studying."
4. Now do for yourself what you did for the "Example." In the column headed "My Time," enter an amount of time for each activity that appears in the "Activities" column. If you are not sure of an exact amount of time, then estimate the amount of time you spend doing that activity.
5. Go through the subtraction process in columns headed "My Time" and "168 HOURS" just as you did with the example in columns "Example" and "168." In the cell at the intersection of the "Eating" line and the "My Time" column, enter the time you spend eating. Now subtract your eating-time value from 168 and place the remainder in the "168 HOURS" column. Continue in this way until you are left with a final remainder. Write that number at the bottom of the "168 HOURS" column. The number you enter represents your "Time Available to Spend Studying."

My Time Table

Activities	Example	168	My Time	168 HOURS
Necessary Activities				
Eating	14	154		
Sleeping	56	98		
In Class	12	86		
Commuting	8	78		
Special Activities				
Job	20	58		
Volunteer Service	4	54		
School Clubs	2	52		
Leisure Activities				
Socializing	8	44		
Dating	5	39		
Hobbies	2	37		
Other Activities				
Watching TV	8	29		
	3	26		
Time Available to Spend Studying		**26**		

A Sample Study Schedule

Analysis 16-1 shows that 26 hours are available in the example for study time. Here is a schedule based on spending 24 of those hours per week studying. The word "Yes" represents study time.

	MON	TUE	WED	THUR	FRI	SAT	SUN
6-7 AM							
7-8							
8-9	class		class		class		
9-10	Yes	class	Yes	class	Yes		
10-11	Yes	class	class	class	Yes		
11-12 PM	class	Yes		Yes	class		
12-1							
1-2	class	Yes	class	Yes	Yes		
2-3	class	Yes	class	class	Yes		
3-4							Yes
4-5	job	job	job	job	job	job	Yes
5-6	job	job	job	job	job	job	
6-7	job		job		job	job	
7-8	job		job		job	job	
8-9							
9-10	Yes	Yes	Yes	Yes			Yes
10-11	Yes	Yes	Yes	Yes			Yes
11-12 AM							
12-1							
1-2							
2-3							
3-4							
4-5							
5-6							

The schedule above is an example. Let's turn now to *your* schedule. When are you going to fit in the amount of time you have for studying? Use the following blank chart to plot your ideal study week. Before you start plotting, read the following tips:

1. Don't plan on studying at those times when other activities are likely to win out.
2. Avoid scheduling study periods for longer than two hours without planning for a 15 to 20 minute break. Research shows that people are more effective when they use a work-break-work approach than when they just work-work-work only.
3. If you are going to study two subjects within a given block of time, try to schedule dissimilar subjects, for example: math and history. The difference will heighten your interest and enhance your ability to focus on what you are studying.
4. Try to plot some study time immediately after classes. The mental state for that class cannot be duplicated later in the day or at another time. The discussion, explanation, and examples are still fresh in your mind. Right after class is prime study time. Seize this time for study.
5. Study a *minimum* of 12 to 15 hours per week. The rule of thumb in college is 2 to 3 hours of study outside of class for every hour in class. If your program is especially demanding, then you will have to spend more time studying.
6. Treat yourself right and don't try to study during those times when it just doesn't seem to work.
7. Study smart by using SMART.

Keep the above points in mind as you complete Analysis 16-2.

ANALYSIS 16-2: Establish Your Study Schedule

Complete the schedule below. Base your study schedule on the number of study hours you identified at the bottom of column "168 HOURS" in Analysis 16-1.

My Plan	MON	TUE	WED	THUR	FRI	SAT	SUN
6-7 AM							
7-8							
8-9							
9-10							
10-11							
11-12 PM							
12-1							
1-2							
2-3							
3-4							
4-5							
5-6							
6-7							
7-8							
8-9							
9-10							
10-11							
11-12 AM							
12-1							
1-2							
2-3							
3-4							
4-5							
5-6							

Assessing Your Study Schedule

Let your completed schedule serve as your guide to acquire the habit of studying at specified times. You like to eat regularly, don't you? Then feed your analytical mind with the same regularity that you feed your body! At the same time, stay flexible. If the desire or need to study occurs at an unscheduled time, then go ahead and study. Never be without a book. In the time you spend waiting in line, waiting for a friend, and waiting for the clock to tick, you can read your way to a liberal education.

Chances are, the first schedule you set up will have to be changed. Actual experience with using a study schedule will show where and when you need to adjust it. That's to be expected. If experience shows that your schedule is unrealistic, or if your activities and responsibilities change, then change your schedule. When midterms, finals, or special assignments approach, you may want to load up your study schedule.

ANALYSIS 16-3: Assess How Well Are You Using Your Schedule

Live with your study-time schedule for a couple of weeks. Then assess its accuracy and your use of it. Use the following table to monitor the time you actually spend studying. Put the chart on a wall where you study or place it in a handy notebook.

Date	Scheduled Study Hours (See Analysis 16-2)	Actual Study Hours	Difference (+ or -)	Comments
Totals:				

Keep the assessment chart for two weeks. For those times when you did not follow the plotted schedule, determine whether it was a one-time thing or whether a pattern is evident. If there is a pattern of non-study, take the study hours from that time block and move them elsewhere. The goal is to place the study-time blocks where you will actually use them.

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The best way to build a solid study habit is to establish and keep a schedule. Keeping a fairly constant study schedule is a signal to yourself that you are actually in charge of yourself and your time. Keeping a study schedule shows that you can deal with outside distractions. It shows that you are keeping your major educational objective constantly in mind. That major objective is ***to graduate***.

The poet, William Yeats, wrote that "time is a song." With your study time, you can write a song that can be especially meaningful while you are in school and for the rest of your life. It is your time ... and it will be *your* song ... and it *can be* a very good song ... and you have the power to make it so.

HOW TO TALK TO A TEACHER

All managers in all walks of life need help, and good ones ask for it. Counselors and librarians as well as teachers expect to be asked for help. Wanting to help others is part of the reason they became educators. They expect all kinds of questions, and they are usually willing to go out of their way to answer them. Because they come into contact with many students, teachers usually know a lot about students and their problems. They can be a good source of counsel and advice. They obviously are a source of help on the subjects they teach.

Ask for help any time you feel you need it. If it's a small problem, then a conversation before or after class may be all that is necessary. Otherwise, take full advantage of your teacher's office hours. These hours are scheduled especially for you. If your schedule conflicts with your teacher's office hours, then make a special appointment with your teacher.

For personal problems (finances, friends, family, your future) select a teacher with whom you feel comfortable and who you think can help. A teacher may not be able to provide direct assistance on personal problems, but teachers often know of others in school or on campus (counselors, financial aid officers) who may be able to offer assistance.

For course-related problems, understand that teachers are ready and willing to help you. Don't feel that the teacher should not help you with assignments. If you have tried and are stuck, there is nothing wrong with a teacher's guiding you toward, or providing you with, an answer. This is part of a teacher's job, one that most teachers welcome. While a teacher can still help a student who says: "I just don't know what's going on," it helps if you can be specific regarding the help you need.

ANALYSIS 16-4: Teachers' Office Hours

Complete the following table. Use the information whenever you want help.

Course Name	Teacher's Name	Office Location	Office Hours

ANALYSIS 16-5: Visit a Teacher

Select a teacher. Show the teacher the results of Analysis 16-2. Ask the teacher to comment. Summarize your meeting with the teacher here:

USE THE LIBRARY

The word "school" means a group of students gathered together for the work of learning. The word "college" means a group of people gathered together for a common purpose. You will find no greater gathering of people, past and present, than that in your school or college library.

The library is an intellectual time machine. It allows you to understand the past and present so you can enter the future at intellectual warp speed. The library is a place to do many excellent activities:

- ✦ obtain information
- ✦ read and study
- ✦ keep up-to-date
- ✦ browse and explore

Here is an analytical view of the library:

Title: An Analytical Display of a Library

(1) Purpose (Why?)
- to serve as a source of information
- to keep patrons up-to-date
- to provide a place to read and study
- to enable one to browse and explore

(2) **Resources** (What is needed?)
- librarian
- card-based catalogue
- computer-based catalogue
- printed material
- machine-readable material
- spoken material
- visual material
- visual and spoken material
- other materials

(3) **Activities** (What is done?)
- identify the nature of the materials you need
- ask for help
- do bibliographic research
- browse the stacks

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive (if purpose is achieved): Understanding of the world is broadened, information for term paper and other assignments is obtained, knowledge of current events is improved, personal growth is achieved.

Negative (if purpose not achieved): Understanding of world can remain narrow, term papers and other projects can be poorly supported, knowledge of subjects can remain dated.

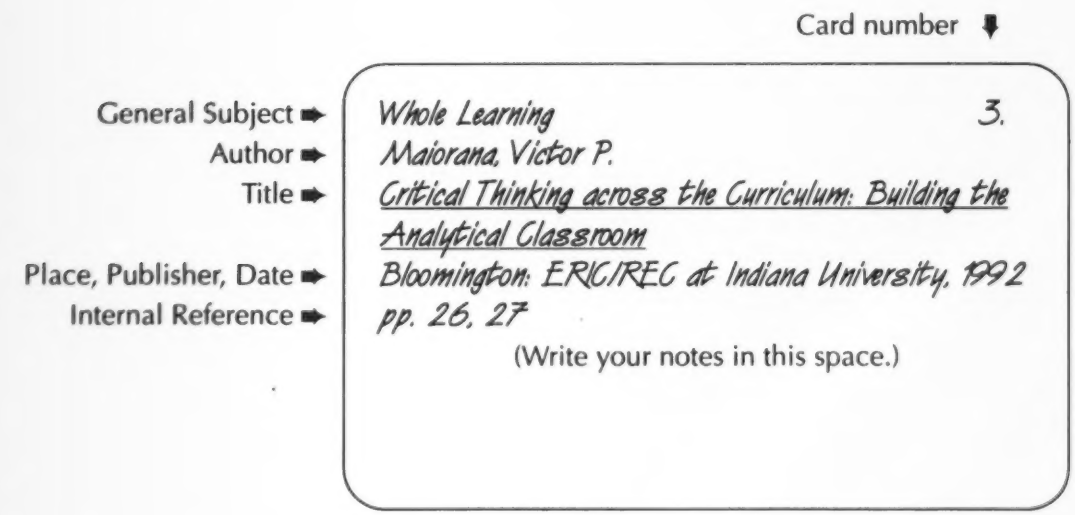
You can find out about the resources offered by your library by spending time there and talking to librarians.

Bibliographic research is an activity you can do in the library. This research involves using a library's resources to gather information through reading, viewing, and listening. Earlier, the term referred to using books — *biblio* — only. As the analytical display above shows, however, a library may contain many different types of resources. Today the term "bibliographic" research refers to consulting any material, book and non-book.

When you do research, keep a written record of the material you consult. Record information on index cards or notebook paper. Write out complete references to the source as well as passages you intend to quote. These notes are a record of the information you need in order to support your term paper and other writing assignments. The notes also help you prepare footnotes, references, and a bibliography. Write down precise and full bibliographic information while you do your research in the library: author's full name, full title of the item, place of publication, publisher, date of

publication, page numbers and/or other internal references. "References" are the words you actually cite in your report. A bibliography is a list of the other sources you used to prepare your report.

Here is a typical bibliographic research note card:



Follow these guidelines when taking reference notes:

- Write out your notes at the same time that you are consulting the source.
- Record only what is necessary. Summarize important points in your own words. If you copy passages word for word, then place quotation marks around the verbatim copies. Make sure your notes are accurate. For each point summarized or quoted, write down the page number and/or other internal reference.
- If you use several cards for the same source, number the cards.

ANALYSIS 16-6: Bibliographic Research

Prepare a reference note about a book you select. Include a summary of an idea in the book as well as a quoted passage.

ANALYSIS 16-7: When You Were New

Look up a newspaper for the date you were born or a magazine for the month and year you were born. Select an article, prepare reference notes, and then write a summary of the article.

DO WELL ON EXAMS

Your performance in school, in personal relations, in your career, and in life is a highly personal affair for which you are directly responsible. Exams measure your state of learning. Exams are more for you than they are for your teacher. Exams are your way to ask and answer the question: "How am I doing at school?"

How well you do on exams is directly related to (a) how well you understand the types of questions asked on exams, (b) how well you prepare for exams, and (c) how well you manage the actual taking of exams.

Preparing for Exams

Know the exam topics to be covered: Ask your teacher to identify the topics that the exam will cover and which of these will be emphasized.

Know the type of question to be asked: If the questions are to be mostly fill-in-the-blanks or true/false or multiple-choice questions, it is likely that the answers will require recall of facts and definitions. Essay questions usually mean more emphasis on concepts and their application to different situations — an opportunity to put your analytical skills to use.

Use the review provided by the teacher: Teachers often review for exams by providing a list of topics to be covered. They may say which of the topics will be emphasized. They may identify the type of questions to be asked. If you make a note of these comments, you will be able to establish an effective review plan.

Review your study materials: Gather your notes and do the following:

- Look at key words and ideas; recite (silently or out loud) the associated material.
- Develop an analytical display for each major topic. If you have already developed analytical displays, then do the following: Take only the title and statement of purpose from each display, and determine what the rest of the display might look like. Given the title and purpose, you are testing your ability analytically to recall associated ideas. If you get stuck, ask someone to read to you a few entries from your original display.
- Review materials with a fellow student. These sessions can be both a systematic review of notes and also free-form sessions in which you put questions to each other in no particular order. Sessions conducted at least three days in advance of exams can help you identify gaps in your knowledge. Fill up the gaps in the time remaining.

Taking the Exam

Arrive on time: Some teachers may not let you take an exam — or may not even let you into the exam room — if you are late.

Come prepared: Make sure you have everything you will need: pencil, pen, eraser, ruler, calculator, paper.

Enter your name and any other required information on the exam sheet.

Conduct an exam overview: Read the test directions — ALL OF THEM — first. Must all questions be answered? If not, what is the basis for choosing? Must the questions be taken in order? Is there a time limit for answering certain questions? Is one section more important than the others or weighted more heavily in terms of grading?

Read each question carefully so you will understand what is being asked. Answer all the easy questions first. Pace yourself so that you answer as many questions as you can in the time allotted.

When answering multiple-choice questions:

- When you're not sure of an answer, eliminate the least likely answers, and choose from what remains.
- If an answer does not come easily, leave the question unanswered and come back to it later.

When answering true/false questions:

- First, answer those to which you know the answers.
- If you get stuck, come back to a question later.
- If *any part* of a true /false statement is false, then the answer is "false." For example, the answer to the following true/false question is "false" because the second part of the question is false, even though the first part is true: "Two plus two equals four, and three plus three equals seven."

BACK TO YOUR FUTURE

You have learned now to use analytical Whole Learning as your way to master all of your course work and all of your subjects. What do you do, however, when your teachers still try to teach you the old-fashioned way, with sequential rote-learning memorization?

No matter how your teacher teaches, you may go ahead and learn analytically. Take notes, read your books, prepare for exams, organize your essays and papers, and do anything else you need to do, but do them analytically. Be sure, however, to submit assignments to your teachers in the required format. If a formal report is required, submit

your material in formal report format. The combination of your analytical thinking and your ability to follow instructions will help make you an "A" student. This combination will also help make you outstanding in the workplace.

Remember, Whole Learning allows you to go back to being that natural, analytical child that was lost when you started sitting in formal classrooms. Whole Learning is a return to learning whole words, whole ideas, whole worlds of meaning at a single analytical lick. Grasping things and ideas in their meaningful context without relying on rote memory and without arranging them sequentially, is the heart of Whole Learning. Whole Learning makes intellectual music because you hear all the topics play in context and in concert.

Your education is not a rehearsal. What you learn now and *how you learn* now has a serious impact both now and in the future. Attending classes is your life now. Whole Learning strategy can help make that life especially meaningful. Your intellectual growth, your academic achievement, your ability to obtain a well-paying job, your success in your career, and your personal happiness all largely depend on how well you learn to learn. Whole Learning helps you to learn to learn.

Now that you have become an analytical Whole Learner, congratulations! You're that analytical child again but with a grown-up mind. You're on your way to making beautiful music with your analytical mind.

QUESTIONS

1. Why is it important to establish a study schedule?
2. What's the smart move to make if it turns out that you are not keeping your study schedule?
3. When asking a teacher, counselor, or librarian for help, why is it best to be specific in what you ask for?
4. What sort of information should you record on a bibliographic research card?
5. What are some good ways to prepare for exams?
6. What are some effective strategies for taking an exam?

Appendices

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Appendix A

Templates for Analytical Displays and Narratives

(Owners of this book are invited to duplicate the templates as needed.)

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Analyst: _____ *Date:* _____

Subject: _____ *Topic:* _____

Source of Raw Subject Matter: _____

Title: An Analytical Display of _____

(1) **Purpose** (Why?)

(2) **Resources** (What is needed?)

(3) **Activities** (What is done?)

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive:

Negative:

Vocabulary Box (explanation of special terms)

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ANALYTICAL NARRATIVE

Topic:_____ Date:_____

Written by_____

Appendix B

Whole Learning for Speakers of English as a Second Language

Your teacher may want to go through this material with you in class. You can also go through the material with the help of a friend whose first language is English.

ASSIGNMENT B-1: Review an Analysis Out Loud

Note: The following instructions can be read out loud by the classroom teacher or by a friend.

1. *Teacher:* Group students by their first languages.
2. *Teacher:* In your own words, tell your students that you are going to show them another way to learn. The other way is called *Whole Learning,* and it is active, fun, and can be used in all the courses they are taking and will ever take. Tell them that if they use Whole Learning, they will achieve, persist, and graduate.
3. *Teacher:* Ask your students to turn to page 241. Direct their attention to the display titled "An Analytical Display of the Hand." Slowly read the display out loud to the entire class. Read the display in this order: Title, Purpose, Resource, Activities, and Consequences. Hold up your hand as you read the title. Point to each part of the hand as you describe the resources. Gesture with your hand as you describe the activities. Describe the consequences.
4. *Teacher:* Tell your stduents that you are going to reread the display. Repeat step 3 at a slightly quicker pace.
5. *Teacher:* Now select a language group. Ask a student within that group to translate the word "title" into his/her *first* language. Have the student repeat the first-language word out loud to the class.
6. *Teacher:* Now write the word "Title" on the board. Have the student you called on write his/her translation next to it on the board. Ask the other members of the same language group to write their translation on their individual copies of the display. Have them write in the bracket that appears above the word "Title."
7. *Teacher:* Repeat steps 5 and 6 for the words: "Purpose," "Resources," "Activities," and "Consequences." Have students write their translations in the brackets provided.
8. *Teacher:* Repeat steps 5, 6, and 7 with all remaining language groups.

Title: An Analytical Display of the Hand

(1) **Purpose** (Why?)
- to hold an object

(2) **Resources** (What is needed?)
- brain
- fingers
- palm
- skin
- wrist
- object

(3) **Activities** (What is done?)
- think
- reach
- grasp

(4) **Consequences** (What can happen if purpose is/is not achieved?)

Positive: Objects can be used.

Negative: Muscles get tired if an object is held too long.

ASSIGNMENT B-2: Translate the Words that Appear in the Display

If you are an ESL student, team up with a classmate whose first language is English and together complete the translation chart shown below. Use the analytical display you developed in Assignment B-1.

Translation Chart for ESL Students

English	**Your first language**
TITLE	
An	
Analytical	
Display	
of	
the	
Hand	
PURPOSE	
to	
hold	
objects	
RESOURCES	
brain	
finger	
palm	
skin	
wrist	
object	
ACTIVITIES	
think	
reach	
grasp	

English	**Your first language**
CONSEQUENCES	
Positive:	
The	
object	
can	
be	
used.	
Negative:	
Muscles	
get	
tired	
if	
the	
object	
is	
held	
too	
long.	

ASSIGNMENT B-3: Translate the Display of "The Hand" into Your First Language

In the [brackets] below, enter the term in your *first* language for Title, Purpose, Resources, Activities, and Consequences.

Then, complete the rest of the display also in your *first* language. Write in the words you translated in Assignment B-2.

Title [ ]: An Analytical Display of the Hand [ ]

(1) **Purpose** [ ]

•

(2) **Resources** [ ]

•

•

•

•

•

•

(3) **Activities** [ ]

•

•

•

(4) **Consequences** [ ]

[ ]

[ ]

ASSIGNMENT B-4: Translate the Display of "The Hand" into English

1. For this assignment, work by yourself.
2. Using the work you did in Assignment B-3, translate the analytical display of "The Hand" into English. You can use the English column in Assignment B-2 as a guide to help you translate the words.

[ ]:

(1) [ ]

•

(2) [ ]

•

•

•

•

•

•

(3) [ ]

•

•

•

(4) [ ]

[ ]

[ ]

ASSIGNMENT B-5: Write an Analytical Narrative in English

Write an analytical narrative in English based on the display you developed in Assignment B-4. The first sentence has been written for you. Write the remaining sentences. Write a sentence for the resources. Write a sentence for the activities. Write a sentence for the positive consequences. Write a sentence for the negative consequences.

Topic: Narrative on the Hand Date: _____

Written by _____

One purpose of the hand is to hold objects. _____

QUESTIONS

1. The hand serves many purposes. The analytical display in Assignment B-2 deals with one of them. Think of another purpose for the hand.
   (a) Prepare an analytical display and an analytical narrative in your first language.
   (b) Translate your display and narrative into English.

2. Think of a purpose for your feet.
   (a) Prepare an analytical display and an analytical narrative in your first language.
   (b) Translate your display and narrative into English.

3. Think of a purpose for learning the English language.
   (a) Prepare an analytical display and an analytical narrative in your first language.
   (b) Translate your display and narrative into English.

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Before becoming a full-time teacher, Professor Maiorana's major assignment was chief electrical engineer for the Apollo Space Program's *LEM* (Lunar Excursion Module). His ability to promote clear understanding among teams of NASA engineers, rocket scientists, and astronauts working on complicated problems of spaceship design, made him a favorite speaker at NASA management meetings.

Professor Maiorana developed his multidimensional critical framework for viewing subject matter analytically first in his doctoral dissertation. For this research, he won both the New York University Paul S. Lomax Award for Scholarship and Leadership, and the Delta Pi Epsilon Award. Whole Teaching-Whole Learning was subsequently expanded in the Tech Prep environment and across the high-school and college curriculum. Professor Maiorana now guides numerous inservice workshops with teachers at many levels in many different kinds of schools. He assists his teaching colleagues in their own elaboration of Whole Teaching-Whole Learning for their respective disciplines and in their unique instructional settings.

Victor Maiorana's approach is more than an intellectually consequential, methodological alternative to conventional learning strategies; it is also a concerned teacher's student-centered effort to strengthen the abilities of kids trying to make it in school and in life. Maiorana is the author of sixteen books, including *Critical Thinking across the Curriculum: Building the Analytical Classroom* (ERIC/REC, 1992) and *The Analytical Teacher: Whole Teaching-Whole Learning for the High School and College Classroom* (ERIC/REC, 1995).

Purpose

Resources

Activities

Consequences

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